PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

1878.

PRINTED FOR THE SOCIETY,
AND SOLD AT THEIR HOUSE IN HANOVER SQUARE.
LONDON:
MESSRS. LONGMANS, GREEN, READER, AND DYER,
PATERNOSTER ROW.

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ERRATA.

Page 666, line 7, for *rufo-niger* read *brunneo-niger*.
Page 667, line 2, for *rufo-niger* read *brunneo-niger*.
Page 670, line 18, *for* are not yet quite adult *read* are quite adult.
Page 723, line 2 from bottom, *for* p. 535 *read* p. 527.
Page 929, line 1, *for* Western *read* Eastern.

PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 15, 1878.

Robert Hudson, Esq., F.R.S., in the Chair.

The following report on the additions to the Society's Menagerie during the month of December 1877 was read by the Secretary:—

The total number of registered additions to the Society's Menagerie during the month of December 1877 was 103, of which 17 were by birth, 28 by presentation, 24 by purchase, 21 by exchange, and 13 were received on deposit. The total number of departures during the same period, by death and removals, was 101.

The most noticeable additions during the month were:—

1. A Family of Gelada Baboons (*Cynocephalus gelada*), deposited by Mr. C. Hagenbeck, December 7th, consisting of an adult male, three young males, and four females of this singular and little-known Monkey. A single example of it was once before exhibited for a short time in the Society's Menagerie; but this is the first occasion on which we have had an opportunity of watching their curious habits and observing their grass-eating propensities.

2. A pair of Musk-deer (*Moschus moschiferus*), presented by Sir Richard Pollock, K.C.S.I., H.M.Z.S., Commissioner at Peshawur, N.W. P., and arrived December 15th. This is believed to be the first pair of Musk-deer that have reached Europe alive. They have been placed temporarily in one of the outer cages of the New Lion-house, and seem likely to do well.

The Secretary read the following letter from Mr. A. Anderson, F.Z.S., containing a correction of his last paper on the Raptorial Birds of the N.W. Provinces:—"I find that Mr. Hume is right in his conjecture [1] that the bird figured at pl. xxiii. P. Z. S. for 1876, as *Falco babylonicus*, is an abnormally coloured *F. barbarus*.

"Mr. Gurney, who has kindly (at my request) reexamined the bird, and compared it with specimens at the British Museum, has authorized my publishing the following memorandum which he has drawn up on the subject.

"*Memorandum.*

"At the request of Mr. Anderson I inspected the Falcon, figured in the Society's 'Proceedings' for 1876, on pl. xxiii., as a specimen of *Falco babylonicus*, before that figure was drawn. The specimen struck me as smaller than any *F. babylonicus* I had previously seen, and as having rufous edgings to a larger proportion of the feathers of the mantle; but it certainly did not occur to me that it was any thing else than a small male of *F. babylonicus*, with the male of which species I was not, however, well acquainted, the specimens of that Falcon in the Norwich Museum being apparently, by their size, all females.

"At p. 140 of 'Stray Feathers' for 1877 this Falcon is referred to; and the Editor suggests that it is too small for *F. babylonicus*, and 'might perhaps be *F. barbarus*.'

"In consequence of this remark, I recently took the skin, at Mr. Anderson's request, to the British Museum for comparison, and found that it closely agrees with a Falcon from Nubia in that collection, both in size and in coloration; this Nubian Falcon has been identified by Mr. Sharpe with *F. barbarus*, and is specimen *a.* in the enumeration given at p. 387 of vol. i. of his British-Museum Catalogue.

"I believe that Mr. Sharpe's identification of this specimen is correct, and that both it and Mr. Anderson's Etawah Falcon are abnormally coloured specimens of *F. barbarus*.

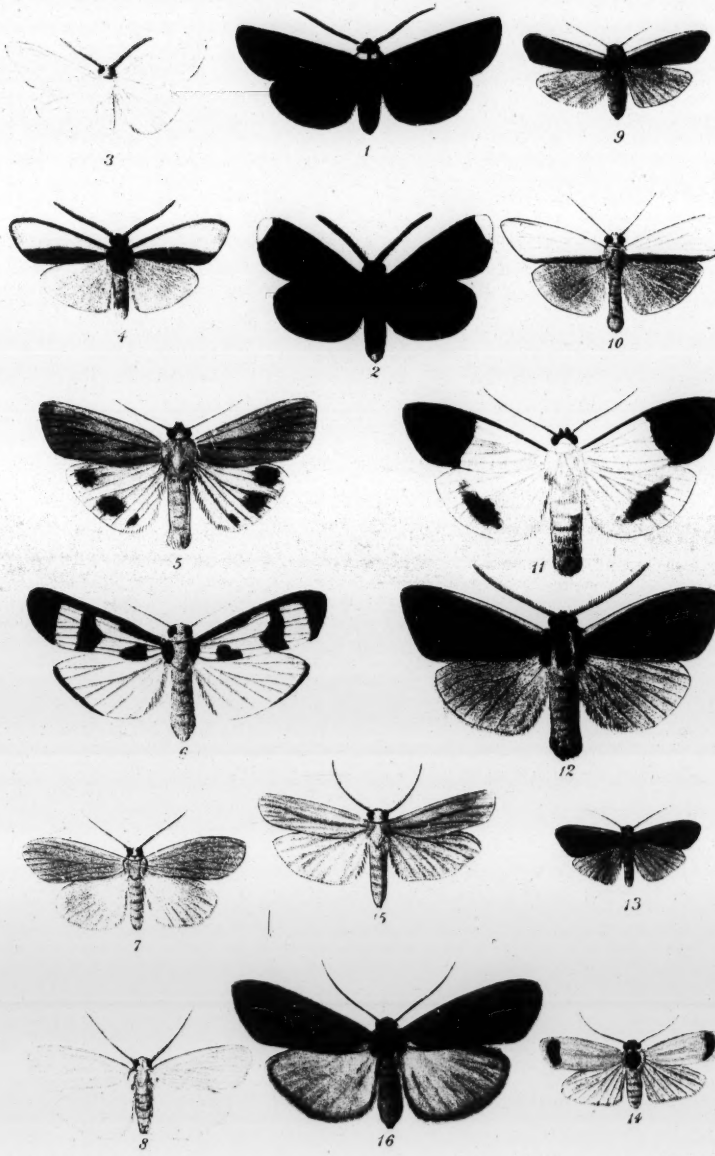
"J. H. Gurney.

"*6th December*, 1877.

"In expressing my regret that the mistake in question should have occurred, I may remark that I believe the present is the first recorded occurrence of an adult *F. barbarus* within the limits to which I have restricted my researches, whereas the capture of *F. babylonicus* has been of comparative frequency; the addition therefore of the former (*F. barbarus*) to my plains Catalogue is of greater importance than if it had been the latter (*F. babylonicus*)."

The following papers were read:—

[1] Cf. 'Str. Feath.' for 1877, p. 140.



F.Cooke del. et lith.

Hanhart imp.

ASIATIC LITHOSIIDÆ.

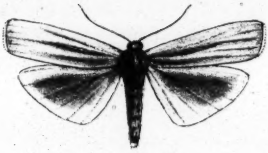



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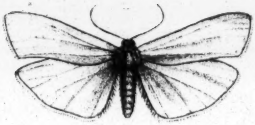

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18.

R. Mintern. del. et lith.

Minterns Bros. imp.

ASIATIC LITHOSIIDÆ.

MUSEUM



1.



13.



7.



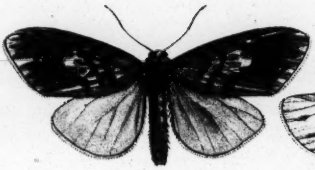
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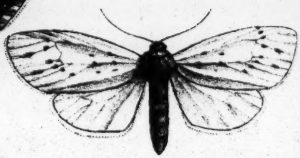
8.



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6.



18.



12.

R. Mintern. del. et lith.

Mintern Bros imp

ASIATIC LITHOSIIDÆ.

1. A Revision of certain Genera of European and Asiatic Lithosiidæ, with characters of new Genera and Species.

By F. Moore, F.Z.S., Assistant Curator, India Museum, London.

[Received October 29, 1877.]

(Plates I.–III.)

Family Lithosiidæ.

Subfamily Hypsinæ.

All the genera in this subfamily possess a peculiar stridulatory apparatus in both sexes. This is distinctly visible on the upperside of the posterior margin of the fore wing, and as viewed from the *underside* of the wing appears as a short oval nacreous cavity, situated between the submedian vein and the extreme margin, along the upper edge of which projects a raised longitudinally oblique fold, which is smooth in some, and transversely scabrous in others; and on the *upperside* of the hind wing is a patch of scabrous scales, or a short transverse outwardly-curved raised scabrous bar, which, by the motion of this wing, evidently plays upon the raised fold over the edge of the cavity, and produces a stridulating sound.

Hypsa, Hübner, Verz. bek. Schm. p. 172.

Hypsa canaraica, n. sp.

Female. Upperside—fore wing cinereous brown; veins white; base of wing ochreous and spotted with black; a whitish clavate streak from lower end of the cell; cilia cinereous: hind wing white, with broad black marginal band crossed by white veins; four black discal spots and a short anal streak; cilia whitish. Thorax ochreous, with small black spots; abdomen brighter ochreous, with a dorsal and lateral row of black spots. Underside cinereous brown, basal half of fore wing white, with two broad black spots within, and a third below the cell; hind wing as above, with the marginal band extending along the costa. Near to *H. heliconia*.

Expanse 2 inches.

Canara (*Ward*). In coll. F. Moore.

Hypsa sericea, n. sp.

Male. Upperside pale silky ochreous-yellow; cilia whitish: fore wing with the base brighter and dotted with black; an indistinct whitish spot from lower end of the cell: hind wing with costal border whitish; a broad cinereous brown marginal band and two confluent longitudinal discal streaks. Body pale ochreous-yellow; abdomen brighter with dorsal and lateral row of black spots; palpi with black terminal point and two lateral spots; legs grey, streaked with black. Underside cinereous brown; fore wing with yellow hind margin and basal costal streak; hind wing with marginal band and

discal streaks almost confluent, being separated only by a narrow yellow division.

Expanse $1\frac{7}{8}$ inch.

Canara (*Ward*). In coll. F. Moore.

Near to *H. heliconia*.

DAMALIS, Hübner.

Damalis, Hübner, Verz. bek. Sch. p. 172.

DAMALIS CONCANA, n. sp.

Near to *H. alciphron*, Cram. pl. 133. f. E.

Upperside ochreous; cilia white: fore wing at base bright ochreous and dotted with black; a small whitish streak from lower end of the cell: hind wing with black marginal band crossed by pale veins, and two irregular longitudinal discal streaks. Thorax with black dots; abdomen with dorsal and lateral row of black spots; legs whitish, streaked with black. Underside—fore wing pale ochreous-brown; hind margin yellow; cell white, bordered with black and enclosing a black spot: hind wing yellow, with paler black marginal band, and streaks as above.

Expanse $2\frac{3}{8}$ inches.

Canara (*Ward*). In coll. F. Moore.

DIGAMA, Moore.

Digama, Moore, Catal. Lep. E.I. C. ii. p. 298 (1858).

Fore wing—first branch of subcostal long, free; second at a considerable distance before end of the cell, trifurcate; fifth from near end of the cell, curved upward and looped to third at one third its length; radial from end of the cell; discocellulars nearly erect; median vein four-branched, upper from end of the cell, second and third from angles near its end. Hind wing with two subcostal branches beyond the cell; discocellulars curved outward, oblique; four median branches, three upper from end of the cell. Below the submedian vein on the underside of the fore wing, is a short longitudinal cavity, along the upper edge of which projects a raised transversely scabrous narrow bar; and on the upperside of the hind wing is a short transverse outwardly curved raised scabrous bar, so placed that, by the motions of this wing, it evidently plays across the longitudinal bar on the fore wing and produces a stridulatory sound.

DIGAMA HEARSEYANA.

D. hearseyana (part), Moore, Catal. Lep. E.I. C. ii. p. 298. pl. 7 A. f. 3 *a*, ♀ (1858).

Male and female. Upperside—fore wing greyish brown, with four basal transverse series of black spots, and an intermediate spot in the cell, with paler interspaces along the veins and wavy bands across the disk: hind wing and abdomen ochreous yellow, the latter with dorsal row of black spots. Thorax, head, and palpi grey-brown; front and middle of thorax black-spotted; joints of palpi with terminal black band; legs black-banded above, pale ochreous

beneath. Underside—fore wing uniform pale grey-brown; hind wing with a small black discocellular spot at upper end of cell.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{10}$ inch.

N.W. India (Allahabad, Manpuri, Deyra, Simla).

In the Catalogue Lep. East-India Company, above quoted, is described and figured (fig. 3) a male insect from Ceylon, which I then considered to pertain to this species. The Ceylon specimens, however, are very distinct; and the species has been named by Felder as *D. insulana*.

DIGAMA INSULANA.

Digama insulana, Feld. Verh. zool.-bot. Gesch. 1868, p. 285.

D. hearseyana (part), Moore, Catal. Lep. E.I. C. ii. p. 298, pl. 7. f. 3, ♀ (1858).

Male and female. Upperside—fore wing pale grey-brown, basal spots prominent: hind wing ochreous yellow, male with a grey-brown marginal streak, and female with a short marginal spot, situated near the middle. Head and thorax pale grey-brown, black-spotted; abdomen ochreous, with dorsal black spots; antennæ brown in male; legs black-banded above; palpi with terminal black bands. Underside paler; both wings with a black spot at end of the cell.

Expanse $1\frac{1}{8}$ inch.

Ceylon. In coll. India Museum.

DIGAMA SIMILIS, n. sp.

Male and female. Allied to *D. hearseyana*, but of smaller size; fore wing similarly marked; hind wing in the male with a dusky brown marginal streak from near anal angle, and another near apex, the latter only present in the female.

Expanse ♂ 1, ♀ $1\frac{1}{10}$ inch.

N.W. Himalaya (Simla). In coll. F. Moore.

DIGAMA FIGURATA, n. sp.

Male. Upperside—fore wing greyish white, with very prominent brown basal spots, two median, transverse, irregular, sinuous, partly confluent bands, and a partly confluent marginal band; a large black spot in middle and a lunule at end of the cell: hind wing pale ochreous yellow, with prominent black marginal marks. Thorax and head white, spotted with black; antennæ brown; palpi white, with broad terminal black bands; abdomen ochreous-yellow, with dorsal and lateral black spots; legs white, with black bands above. Underside—forewing grey-brown, spots in cell visible; hind wing with black spot at end of the cell, and on middle of outer margin.

Expanse $1\frac{3}{10}$ inch.

Burmah. In coll. F. Moore.

CALPENIA, Moore.

Calpenia, Moore, P. Z. S. 1872, p. 571.

CALPENIA KHASIANA, n. sp.

Female. Upperside—fore wing brownish fawn-colour vinous-tinged,

paler along the veins; a broad pale yellow band extending longitudinally from base below the cell and upward to near the costa, being crossed by the veins; some yellow spots on the costa; a small spot and streak at base of cell, and two outer submarginal rows of small dentate spots of chrome-yellow: hind wing chrome-yellow, with four transverse rows of vinous brownish black spots and a rayed basal streak, the spots broadly lunate, irregular in size, the outer row being marginal and the smallest. Antennæ, front of head, and palpi black; thorax dark greyish brown, longitudinally streaked with chrome-yellow; abdomen chrome-yellow, with dorsal and lateral row of spots. Underside same as above; legs dark grey.

Expanse 3¼ inches.

Khasia hills (*Atkinson*). Coll. Dr. Staudinger.

NEOCHERA, Hübner.

Neochera, Hübner, Verz. bek. Schmett. p. 173.

NEOCHERA HELICONIOIDES, n. sp.

Male. Upperside—fore wing purplish cinerous; all the veins narrowly lined with white; base of wing black-spotted, and with a subbasal orange-yellow streak with zigzag borders: hind wing grey-black, washed with purplish blue; three grey streaks from the base and a prominent submarginal grey narrow undulating band; cilia white. Body orange yellow; a black spot on each tegula, one on hind part of thorax, and a dorsal and lateral row of spots on abdomen. Underside grey-black; both wings with white external veins and undulating submarginal band; the basal area broadly white and with a large blackish cell-spot; front of head with a central black spot; palpi and legs white, streaked with black.

Expanse 2⅝ inches.

Luzon, Philippines. In Coll. Dr. Staudinger.

Similar in pattern to *Hypsa heliconia*.

Subfamily LITHOSIINÆ.

The genera are here arranged in the following sectional groups, viz.:—

A. Fore wing with subcostal vein *five*-branched, median vein *four*-branched:

Eligma, Macrobrochis, Tripura, Paraona, Atolmis, Sidyma, Churinga, Vamuna, Mahavira, Korawa, Hesudra, Ghoria, Chrysæglia, Œonistes, Lithosia.

B. Fore wing with subcostal vein *five*-branched, median vein *three*-branched:

Simareea, Tarika, Brunia, Gandhara, Collita, Katha, Eilema, Manulea, Systropha, Chrysorabdia, Capissa, Dolgoma, Mithuna, Cossa, Ranghana, Tegulata.

B a. Hind wing with a recumbent plumose lappet:

Nishada.

B B. Fore wing with a recumbent plumose lappet:
Teulisna, Macotasa, Zadadra, Prabhasa, Gampola.

C. Fore wing with subcostal vein *four*-branched, median vein *three*-branched:—
Pelosia.

D. Fore wing with a plumose, lappet-covered, sac-like cavity on the costal border; *five* subcostal and *three* median branches:
Doliche, Bizone, Cyana.

E. Aberrant group: fore wing with *five* subcostal and *four* median branches:
Baroa, Agrisius, Lyclene, Barsine, Miltochrista, Setinochroa, Setina, Nudaria, Œmene.

GROUP A. *Fore wing with subcostal vein* FIVE-*branched, median vein* FOUR-*branched.*

ELIGMA, Hübner.

Eligma, Hübn. Verz. bek. Schmett. p. 164 (1816).
Panglima, Moore, Catal. Lep. E.I.C. ii. p. 297 (1858).
Surina, Walk. Tr. Nat.-Hist. Soc. Glasgow, i. p. 9 (1869).

Fore wing—first subcostal branch free; second from near end of the cell, trifurcate; fifth from end of the cell, bent up and with a short spur looped to third close to its base; radial from end of the cell; discocellulars bent, upper longest; median vein four-branched, angled at end of the cell, two upper branches from the front and third from angle below the end, fourth from beyond half towards the base. Hind wing—two subcostal branches, and three upper median branches from end of the cell.

Type, *E. narcissus* (*P. narcissus*, Cram. Lep. Exot. i. pl. 73. f. E, F).

China, Java, Penang, S. India.

MACROBROCHIS, H.-S.

Macrobrochis, H.-Schæff. Lep. Exot. Sp. Nov. pl. 72. fig. 531 (1856).

Fore wing—first subcostal branch free, curving upwards at its base towards costal vein; second from near end of the cell, trifurcate; fifth from end of the cell, bent upward and with a short spur looped to third near its base; radial starting from fifth subcostal branch beyond the cell; upper and lower discocellulars bent inward at very oblique angles; median vein bent upward near end of cell, four-branched, two upper from point at end of the cell, third from angle below its end. Hind wing—two subcostal and two upper median branches from beyond end of the cell, third median below its end.

Type, *M. gigas* (*Lithosia gigas*, Walk. Cat. Lep. Het. B. M. ii. p. 494, 1854; *M. interstitialis*, H.-S. *l. c.* f. 531).

MACROBROCHIS LEUCOSPILOTA, n. sp.

Male and female. Differs from *M. gigas* (*Lithosia gigas*, Walk. Catal. Lep. Het. B. M. ii. p. 494) in the fore wing having more elongated white spots, and in the hind wing having the marginal band much narrower and traversed by a series of elongated spots on both upper and underside.

Expanse $2\frac{3}{4}$ inches.

Cherra Punji, Assam. In coll. India Museum, and F. Moore.

MACROBROCHIS NIGRESCENS, n. sp.

Male. Allied to *M. gigas*. Differs in the spots on the fore wing being much less distinct; the basal and discal spots partly covered with black scales and totally obsolete on the underside; on the hind wing the base is only slightly dusky-white on both sides.

Expanse $2\frac{3}{4}$ inch.

N.E. Bengal. In coll. F. Moore.

TRIPURA, Moore.

Tripura, Moore, Catal. Lep. E.I. C. ii. p. 298 (1858).

Fore wing—first subcostal branch free; second from before end of the cell, trifurcate; fifth from end of the cell, bent upward and touching third near its base; radial from end of the cell; discocellulars bent in the middle; median vein four-branched, two upper from angles at end of the cell, third from angle before its end. Hind wing—two subcostal branches beyond cell, three upper median branches at its end.

Type, *T. prasena*, Moore, *l. c.* p. 299, pl. vii. A. fig. 6 (1858).

Himalayas.

PARAONA, n. g.

Fore wing long, narrow, costa slightly arched, apex acute, exterior margin oblique, posterior margin slightly convex towards the base; subcostal vein five-branched; first branch oblique, free; second arising before end of the cell; third starting from above base of second, trifurcate towards its end; radial from end of the cell, curved upward and joined to third subcostal branch, at one fourth its length beyond the cell; discocellulars slightly bent in the middle; median four-branched, two upper at end and third before end of the cell. Hind wing long, somewhat narrow, apex slightly produced, exterior margin and angle convex; two subcostal branches one third beyond the cell; median four-branched, two upper beyond and third from end of the cell. Body stout. Antennæ in the male serrate, the teeth finely pectinate, setose in the female. Palpi small, ascending, pilose beneath, apical joint very minute. Legs stout, short; femora slightly pilose beneath; tibiæ thickened, middle and hind tibiæ spurred.

PARAONA SPLENDENS. (Plate I. fig. 1.)

Crambomorpha splendens, Butler, Trans. Ent. Soc. Lond. 1877, p. 357.

Bombay (*Dr. Leith*). In coll. British Museum, and F. Moore.

ATOLMIS, Hübner.

Atolmis, Hübn. Verz. bek. Schmett. p. 164 (1816).
Gnophria, Steph. Brit. Lep. ii. p. 98 (1829).

Fore wing—first subcostal branch free; second from before end of the cell, trifurcate; fifth from end of the cell, bent upward and touching third at half its length; radial from end of the cell; discocellulars bent inward; median four-branched, two upper from end of the cell, third from angle below its end. Hind wing—two subcostal branches beyond the cell; three upper median branches from its end.

Type, *A. rubricollis* (*N. rubricollis*, Linn).
Europe.

SIDYMA, Walker.

Sidyma, Walk. Catal. Lep. Het. B. M. vii. p. 1686 (1856).

Fore wing—first subcostal branch long, free; second from near end of the cell, trifurcate; fifth from end of the cell and touching third near its base; radial from fifth subcostal branch at some distance beyond the cell; discocellulars bent; median vein angled near end, four-branched, two upper from end, third from angle below end of the cell: hind wing—two subcostal and three upper median branches from end of the cell.

Type, *S. albifinis*, Walk. Catal. Lep. Het. B. M. vii. p. 1686.
Masuri, N.W. Himalayas (*Capt. Lang*).

SIDYMA APICALIS, n. sp. (Plate I. fig. 2.)

Male. Upperside purplish-black; fore wing with a narrow triangular white apical patch. Collar, thorax beneath, and anal tuft orange-red. Underside as above.

Expanse $1\frac{3}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

Smaller than *S. albifinis*, which is known only from Masuri. Distinguished by having the apical white patch on the fore wing only.

CHURINGA, n. g.

Male and female. Wings ample, broad, somewhat short in male. Fore wing with the costa slightly arched towards end, apex pointed, exterior margin oblique, posterior angle rounded; first subcostal branch very oblique, free; second from near end of the cell, trifurcate; fifth from end of the cell, with a loop-spur to the base of the third; radial starting from below the fifth subcostal beyond end of the cell; discocellulars of equal length, bent inward at the middle; median vein four-branched, two upper from end of cell, next at some distance before and lower from half length of the cell. Hind wing convex at the apex; exterior margin rounded, abdominal margin short; two subcostal branches at one fourth beyond end of the cell; median four-branched, two upper from end, next before the end, and lower from half length of the cell. Body large; thorax with long pilose tegulæ. Antennæ in male broadly pectinate, setose in female. Palpi slender, ascending, basal joint pilose beneath, second and third

joints very long, tip blunt. Legs long, femora slightly pilose beneath.

Type, *C. rufifrons*. Will also include *Lithosia beema*, Moore, P. Z. S. 1865, p. 798.

CHURINGA RUFIFRONS, n. sp. (Plate I. fig. 12.)

Male and female. Upperside—fore wing pale purplish ochreous-brown, costal and posterior margins narrowly edged with ochreous yellow; hind wing and abdomen pale ochreous-yellow. Thorax brown; tegulæ edged with yellow; head, collar, and palpi reddish ochreous; thorax beneath and legs bright ochreous; tip of palpi, antennæ, fore legs above, and tarsi, brown. Underside paler.

Expanse, ♂ $1\frac{9}{10}$, ♀ $2\frac{3}{10}$ inches.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

VAMUNA, n. g.

Fore wing long, narrow; costa slightly arched beyond the middle; apex acute; exterior margin short and slightly truncate below the apex, oblique hindward, the angle slightly convex; posterior margin convex towards the base in male. Hind wing broad; apex slightly produced; exterior margin convex in the middle. Veins similar to those in *Churinga* (*C. rufifrons*), excepting that in the fore wing the lowest or fifth branch of the subcostal is emitted from upper angle of the cell, the median branches nearer together at their base, and the lowest nearer the end of the cell. Body moderately stout. Antennæ in both sexes setose. Palpi moderately long, ascending, projecting beyond the head, second joint long, third joint very short. Legs long, naked; middle and hind spurred.

Type, *V. remelana* (*Lithosia remelana*, Moore, P. Z. S. 1865, p. 798).

Darjiling.

VAMUNA MACULATA, n. sp. (Plate I. fig. 5.)

Male. Upperside—fore wing greyish ochreous; hind wing pale dull ochreous at base and whitish externally, with three marginal black spots, the two upper larger, the lower small and at some distance from anal angle. Body ochreous. Underside dull ochreous basally, whitish externally; fore wing with a brownish patch at the apex, a black longitudinal basal streak, and a broad large transverse subapical patch; hind wing with only the lower and middle marginal black spots. *Female* much paler, the apex of fore wing slightly brownish-ochreous; hind wing above and beneath with smaller median and lower black spots; the fore wing with the basal black streak less defined and the subapical spot small.

Expanse, ♂ $1\frac{5}{10}$, ♀ 2 inches.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

VAMUNA BIPARS, n. sp. (Plate I. fig. 11.)

Male. White, costal edge of the base and apical half of fore wing fuliginous black; hind wing with a fuliginous-black submarginal band,

the middle portion of which is very broad and blackest. Antennæ, front of head, and tip of palpi black; fore and middle legs above, a terminal spot on hind tibiæ and their tarsi, black; tarsal joints with a white band; base of palpi, thorax and abdomen, legs beneath, and anal tuft ochreous. Underside duller white; the black band on fore wing confined to the disk, the apical border being pale brownish-ochreous; upper portion of band on hind wing obsolete.

Expanse 2 inches.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Mahavira, n. g.

Male. Fore wing long, narrow, costa arched, apex acute, exterior margin oblique, posterior margin recurved; subcostal vein five-branched, first and second arising before and near end of the cell, third trifurcate, the two lower branches at equal distances from end of the cell; discocellulars long, straight, upper obliquely inward, lower obliquely outward; radial from upper end of the cell; median vein four-branched, the two upper branches from lower end of the cell, third at some distance before its end; submedian vein curving towards hind margin: hind wing longer than broad, exterior margin convex; subcostal vein two-branched beyond end of cell; discocellulars as in fore wing; median vein four-branched, the two upper branches from end of cell and contiguous at their base, third immediately before end of the cell. Body slender. Antennæ serrate, with long and delicate pectinations. Legs slender, femora slightly pilose beneath; middle and hind tibiæ spurred. Palpi slender, porrect, basal joint pilose, apex pointed.

Mahavira flavicollis, n. sp. (Plate I. fig. 3.)

Male. White, costa slightly edged with brown at the base; collar yellow; antennæ yellow; fore femora with a blackish streak on the inner side.

Expanse $1\frac{2}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Korawa, n. g.

Male and female. Fore wing long, narrow; costa slightly arched; apex somewhat acute, exterior margin very oblique; subcostal vein five-branched, first branch ascending and touching the costal but free at its end, second starting before end of the cell, third at end of the cell, trifurcate, lowest branch at one third beyond end of the cell; upper discocellular angled outward at its middle, lower oblique; radial from angle of upper discocellular; median vein four-branched, the two upper from lower end of the cell; submedian slightly recurved. Hind wing moderately short, apex slightly produced and convex, exterior margin rounded; subcostal two-branched beyond end of the cell; discocellulars of equal length, bent inward; median vein four-branched, two upper beyond end of the cell, middle branch from end of the cell; submedian nearly straight. Body moderate.

Palpi small, porrect, pilose. Antennæ minutely and finely bipectinate. Legs pilose, sparsely in male.

KORAWA PALLIDA, n. sp.

Male and female. Semidiaphanous; fore wing pale fleshy-yellow; hind wing white; thorax slightly ochreous-yellow; abdomen white; palpi black-tipped; legs white, fore tibiæ with a black longitudinal line in front.

Expanse ♂ 1½, ♀ 2 inches.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

HESUDRA, n. g.

Male. Wings short, rather broad. Fore wing with the costa nearly straight; apex acute, exterior margin very oblique; subcostal vein five-branched, first branch very oblique, free, running close to costal, second arising before end of the cell, trifurcate, fifth from end of the cell, looped to third near its base; radial from upper end of cell; discocellulars bent in the middle; median vein four-branched, two upper from one fourth beyond the cell, third near its end. Hind wing produced at the apex; exterior margin very oblique, nearly straight; abdominal margin long; two subcostal branches from one fourth beyond the cell; median four-branched, two upper from one third beyond the cell, third close to its end. Antennæ broadly pectinate. Palpi slender, curved upward, slightly pilose at base. Legs slender.

HESUDRA DIVISA, n. sp. (Plate I. fig. 4.)

Male. Upperside pale testaceous: fore wing with a broad dark purplish-grey band occupying the posterior half of the wing; base of the costa also purplish grey; costal border yellowish. Thorax, head, side of palpi, and legs above, purplish grey; abdomen pale greyish, testaceous beneath, tip ochreous; base of palpi and legs beneath pale ochreous; antennæ purplish-brown. Underside—fore wing pale purplish-grey, costal border yellowish; hind wing narrowly edged along the anterior margin with greyish black.

Expanse 1 $\frac{3}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

GHORIA, n. g.

Fore wing long, narrow, costa slightly arched beyond the middle, apex acute, exterior margin oblique and slightly convex, posterior margin long; first subcostal branch very oblique, free; second trifurcate; fifth from end of the cell and bent upward, looped to the third near its base; radial starting from below the fifth subcostal branch at one third beyond the cell; discocellulars obliquely concave; median four-branched, the two upper from end of cell, third immediately before its end, fourth at half its length. Hind wing broad, apex slightly produced, exterior margin convex in the middle; two subcostal branches at one third beyond the cell; median four-branched, two upper beyond the cell, third at its end. Body slender, extending

beyond hind wing. Antennæ setose. Legs slender, squamose. Palpi slender, porrect, base pilose beneath.

GHORIA ALBOCINEREA, n. sp. (Plate I. fig. 10.)

Male. Upperside—fore wing silky white, with a cinereous-brown band along posterior margin: hind wing cinereous; cilia white. Thorax and abdomen white; middle of thorax and streak on tegulæ cinereous brown; collar and front of head, and antennæ yellowish; anal tuft pale brownish ochreous, Underside cinereous brown, palest on hind wing, abdominal margin cinereous white; costal edge of fore wing yellowish towards the apex. Legs cinereous brown above, yellowish beneath; palpi yellowish, tip brown.

Expanse $1\frac{4}{10}$ inch,

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

GHORIA SERICEIPENNIS, n. sp.

Male. Upperside—fore wing silky white, with a broad dark cinereous brown band along posterior margin; hind wing white, pale cinereous brown at the apex and along anterior margin. Middle of thorax and tegulæ, and front of head, dark cinereous brown; abdomen above and beneath white, anal tuft brown; collar yellowish; palpi ochreous yellow; legs above cinereous brown, whitish beneath. Underside—fore wing, anterior border, and apex of hind wing brown.

Expanse $1\frac{2}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

CHRYSÆGLIA, Butler.

Chrysæglia, Butler, Trans. Ent. Soc. 1877, p. 356.

Veins of the fore wing similar to those in *Œonistis entella*. Those in the hind wing differ in the median having but three branches, two only starting from the end of the cell.

Type, *C. magnifica* (*Lithosia magnifica*, Walk. Journ. Linn. Soc. vol. vi. p. 103), from Borneo.

CHRYSÆGLIA FERRIFASCIATA, n. sp. (Plate I. fig. 6.)

Male and female. Upperside golden yellow: fore wing glossy, with a steel-blue band along the costa, a broad transverse median band and a large triangular spot near base of posterior margin; also a blackish outer marginal band, which is broadest in the male; median band dilated hindward and angled on its inner margin below the cell: hind wing with the margin and cilia at the apex slightly blackish. Tegulæ and legs steel-blue. Underside paler yellow; fore wing with pale dusky brown bands as above.

Expanse, ♂ $1\frac{8}{10}$, ♀ $2\frac{2}{10}$ inches.

Nepal (*Ramsay*), Darjiling (*Grote*). In coll. F. Moore.

ŒONISTIS, Hübner.

Œonistis, Hübn. Verz. bek. Schmett. p. 165 (1816).

Fore wing—first subcostal branch long, free; second arising from near end of the cell; third from its end, trifurcate; radial curving

from end of the cell; discocellulars bent in the middle; median vein four-branched, two upper from end, third from angle before end of the cell. Hind wing—two subcostal branches immediately beyond end of the cell, two upper median branches from beyond, and third from end of the cell.

Type, *Œ. entella* (*P. entella*, Cram. Pap. Exot. pl. 208. f. D).

India, Ceylon,

Will also include *Gnophria ceramensis*, Voll. Tijdsch. voor Ent. 1872, iii. p. 246, pl. 12. f. 1.

LITHOSIA, Fabr.

Lithosia, Fabr. Ent. Syst. Suppl. p. 459 (1798).

Sexes dissimilar in colour and pattern. Fore wing with first subcostal branch free, second starting near end of the cell, trifurcate, fifth curving up from end of the cell and touching third near its base; radial from end of the cell in male, from angle of upper discocellulars in female; discocellulars curved in male, angled at both ends in female; median four-branched, three upper from end of the cell. Hind wing with one subcostal branch in male, two in female beyond the cell; two median branches beyond the cell in male, and from its end in female.

Type, *Lithosia quadra* of Europe.

Will also include *Lithosia dives* (*Œonistis dives*, Butler, Ann. Nat. Hist. Nov. 1877, p. 398, from Japan.

GROUP B. *Fore wing with subcostal vein* FIVE-*branched; median vein* THREE-*branched.*

SIMAREEA, n. g.

Similar in form, colour, and pattern to the male of the European *L. quadra*, but of different venation in the fore wing; and both sexes are alike, the discocellulars not being bent at the upper and lower end of the cell (as in female *L. quadra*); and the median vein has only two branches in both sexes proceeding from end of the cell (*L. quadra* having three in the male). In the hind wing the costal vein has two branches beyond the cell in both sexes, *L. quadra* having one only; the median branches also start at some distance from the cell in both sexes. The palpi are more pilose, have the second and third joints much longer, the apex blunt, and projecting much beyond the head.

SIMAREEA BASINOTA. (Plate I. fig. 16.)

Lithosia basinota, Moore, P. Z. S. 1865, p. 798.

Darjiling.

TARIKA, n. g.

Fore wing long, broad; costa arched; exterior margin convex, posterior margin rounded at the base; first subcostal branch short, oblique, anastomosing with the costal, second from near end of the cell, third from near base of second, bifurcate, fifth from end of the cell, bent upward and touching the third at one fourth its length; discocellulars bent inward, upper angled close to subcostal, lower

shortest; radial from angle of upper discocellular; median three-branched, two upper branches at one third beyond the cell; submedian nearly straight. Hind wing broad, apex slightly produced; subcostal branches at one fourth and median branches at one third from end of the cell. Palpi small, short, slightly decumbent. Legs stoutish, naked. Antennæ minutely pectinate. Body slender, not extending beyond hind wing.

TARIKA VARANA. (Plate I. fig. 8.)

Lithosia varana, Moore, P. Z. S. 1865, p. 797.

Darjiling.

TARIKA NIVEA, n. sp.

Lithosia nivea, Walker, MS.

Male and female. Fore wing silky white, costal edge pale yellow; head, front of thorax, palpi, body and legs beneath, yellow; tip of palpi brown; fore and middle legs brown above.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{5}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

BRUNIA, n. g.

Fore wing long, narrow; first branch of subcostal vein short, oblique, anastomosed to the costal, second starting from angle close before end of the cell, trifurcate, fifth from end of the cell and looped to third branch at its base; discocellulars bent below the middle, upper angled close to end of the cell; radial from angle of upper discocellular; two upper median branches at half length beyond end of the cell. Hind wing long, apex produced; two branches of subcostal vein at one third beyond the cell, and two median branches at two thirds beyond. Palpi ascending, pilose beneath.

BRUNIA ANTICA. (Plate I. fig. 9.)

Lithosia antica, Walker, Catal. Lep. Het. B. M. ii. p. 505.

Ceylon.

Will also embrace *Lithosia natara*, Moore, from Java, and *L. sarawaca*, Butler, from Borneo.

GANDHARA, n. g.

Fore wing broad, somewhat short; costa much arched beyond the middle; apex acute; exterior margin slightly oblique, rounded in middle; hind margin slightly rounded at the base; first branch of subcostal vein curving upward and extending free to beyond end of the costal, second and third branches starting together from end of the cell, third trifurcate; discocellulars zigzag, the angles equidistant; radial from upper angle; two upper median branches from lower angle of cell. Hind wing broad, short.

GANDHARA SERVA. (Plate I. fig. 7.)

Lithosia serva, Walker, Catal. Lep. Het. B. M. ii. p. 506.

Darjiling.

COLLITA, n. g.

Wings very broad. Fore wing with the costa arched; subcostal five-branched, first short, oblique, anastomosed to costal, second starting at some distance before end of the cell, third trifurcate, the fifth or lowest branch nearest the base; upper discocellular slightly angled close to subcostal, whence starts the radial; median three-branched, two upper at one fourth beyond the cell. Hind wing very broad, apex produced, exterior margin rounded in the middle, abdominal margin long and extending beyond abdomen; two subcostal branches and two upper medians from one third beyond the cell. Palpi short, porrect.

Type, *C. griseola* (*Lithosia griseola*) of Europe. Will also include *L. vetusta*, Walk., from China, and the European *L. complanula* and *L. stramineola*, Dbleday.

COLLITA LILACINA, n. sp.

Fore wing pale lilac-grey, with pale yellowish costal border; hind wing pale greyish ochreous; thorax grey; head pale yellow; palpi black-tipped; fore legs brownish above.

Expanse $1\frac{1}{2}$ inch.

W. Yunan (*Anderson*). In coll. F. Moore.

Similar in appearance to *Gandhara serva* (*Lithosia serva*, Walk.), from Sikkim, but of entirely different venation.

COLLITA PARVA, n. sp. (Plate I. fig. 13.)

Female. Fore wing greyish ochreous-brown; hind wing and abdomen paler; fore wing yellowish along the costal border. Underside uniform ochreous brown, palest on lower part of the hind wing. Legs cinereous brown above.

Expanse $\frac{8}{10}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

Allied to *C. vetusta* (*Lithosia vetusta*, Walk.), from North China, having the same venation, but is of a much smaller size.

KATHA, n. g.

Wings clothed with stout compact imbricated scales.

Male. Fore wing long, very narrow; costa nearly straight, apex rounded; exterior margin slightly oblique; posterior margin recurved, convex near the base; slightly folded longitudinally below the median vein; cell long, narrow; discocellulars bent outward at upper end and inward at lower end; first branch of subcostal vein at some distance before end of the cell, short, oblique, and anastomosed to costal; second short, arising beyond end of the cell; third trifurcate, its lowest branch at equal distance between second and fourth; radial starting from upper angle of discocellular; two upper branches of median vein at half distance from end of the cell; submedian recurved. Hind wing long, broad; two subcostal branches at one third from cell; discocellulars slightly bent inward; two median branches at one half distance from the cell, and wide apart. Palpi

rather short, pilose at base, porrect. Antennæ minutely pectinate. Legs long, rather stout. Body long, extending beyond hind wing.

KATHA NIGRIFRONS. (Plate I. fig. 15.)

Lithosia nigrifrons, Moore, P. Z. S. 1872, p. 572.

North India.

This genus will also include *Lithosia apicalis*, Walk., from Borneo, *L. intermixta*, Walk., *L. brevipennis*, Walk., from South India, and *L. helveola* of Europe.

KATHA TERMINALIS, n. sp. (Plate I. fig. 14.)

Male. Ochreous; fore wing darkest, with a distinct curved purplish band across exterior margin. Antennæ, front of head, tip of palpi, middle of thorax, and streak on tegulæ purplish black; legs above purplish brown.

Expanse $1\frac{1}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

Allied to *K. apicalis* (*Lithosia apicalis*, Walk. Journ. Linn. Soc. Zool. vi. p. 104) from Borneo, but differs on the fore wing in the apical band not extending upward onto the costa, and in the absence of the slight apical patch on the hind wing, which is present in Bornean examples.

KATHA CUCULLATA, n. sp.

Male. Upperside—fore wing pale purplish grey, costal edge at apex and cilia yellowish; an indistinct greyish-brown outer marginal band: hind wing and abdomen pale ochreous grey; anal tuft ochreous. Thorax, top and front of head, and palpi except at base beneath, black; legs black, middle and hind legs pale beneath; antennæ black. Underside—fore wing brownish ochreous; hind wing pale ochreous.

Expanse $1\frac{1}{10}$ inch.

Andamans. In coll. F. Moore.

Allied to *K. terminalis* and *K. apicalis*.

EILEMA, Hübner.

Eilema, Hübn. Verz. bek. Schmett. p. 165 (1816).

Wings long, narrow. Fore wing with the subcostal five-branched, first short, oblique, and anastomosed to costal, second free and widely separated from third, third trifurcate, the lowest or fifth nearest the base, the two upper near apex; radial from upper end of the cell; discocellulars inwardly oblique; median three-branched, two upper beyond half distance from the cell, lower long, from near its base. Hind wing—two subcostal branches at one third, and two upper median branches at two thirds beyond the cell.

Type, *E. caniola*, Hübner, of Europe.

MANULEA, Wallengren.

Manulea, Wallengren, Ent. Monats. vii. p. 145.

Wings narrow. Fore wing with the costa not arched; subcostal vein

five-branched, first very oblique and free, running close to costal near its end, second arising at some distance before end of the cell, third starting and curving downward from second at half its length, bifurcate, fifth from end of cell and touching the third near its base; radial in a line with subcostal from end of the cell; discocellulars bent in the middle; median three-branched, two upper from one fourth beyond the cell. Hind wing narrow; abdominal margin short; two subcostal branches close to end of the cell; two upper median branches at nearly half length beyond.

Type, *M. gilveola* (*Lithosia gilveola*) of Europe.

MANULEA CALAMARIA, n. sp.

Male. Pale glossy straw-yellow; costal edge of fore wing at base dusky. Head, thorax, body beneath, and anal tuft brighter yellow; palpi black-tipped; legs above, and tarsi entirely, black; antennæ yellow. Underside darker; fore wing pale brownish luteous.

Expanse $1\frac{1}{8}$ inch.

N.W. Himalaya. In coll. F. Moore.

This species is allied to the European *M. gilveola*.

SYSTROPHA, Hübn.

Systropha, Hübn. Verz. bek. Schmett. p. 166 (1816).

Wings small. Fore wing short, narrow; subcostal five-branched, first branch short, oblique, anastomosing partly with costal near its end, second at some distance before end of the cell, third trifurcate, lowest branch at some distance beyond the cell; upper discocellular shortest, lower oblique and bent inward near end; radial from angle of upper; two upper median branches at half distance beyond the cell. Hind wing broad.

Type, *S. aureola* (*Lithosia aureola*) of Europe.

SYSTROPHA DORSALIS, n. sp.

Female. Fore wing straw-yellow, slightly ochreous along posterior margin: hind wing yellowish white. Head, thorax, legs, and abdomen at sides and beneath ochreous yellow; abdomen above lilac-grey.

Expanse $1\frac{2}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

SYSTROPHA AURIFLUA, n. sp. (Plate II. fig. 7.)

Fore wing glossy straw-yellow; hind wing paler yellow. Thorax, head, legs, and anal tuft brighter yellow.

Expanse $1\frac{10}{12}$ inch.

Manpuri, N.W. India (*Horne*). In coll. F. Moore.

CHRYSORABDIA, Butler.

Chrysorabdia, Butl. Trans. Ent. Soc. 1877, p. 357.

Fore wing—first subcostal branch contiguous to costal, second from before end of the cell and bent onto the third above its end, third trifurcate, curved upwards; radial from end of the cell; discocellulars

bent in the middle; median vein three-branched, two upper from end of the cell. Hind wing—two subcostal branches; discocellulars very slender, scarcely visible, two upper median branches.

CHRYSORABDIA VIRIDATA. (Plate II. fig. 1, ♂.)

Lithosia viridata, Walk. Catal. Lep. B. M. Suppl. p. 225.

Darjiling.

CAPISSA, n. g.

Fore wing long, narrow; costa arched before the apex, exterior margin oblique and convex, hind margin slightly convex near the base. Male with a longitudinal fold below the cell[1], where the scales are raised and rough; cell short, narrow; discocellulars of equal length, bent inward; first subcostal branch very short, oblique, anastomosed to costal; second immediately before end of the cell; third at its end, and trifurcate; radial from beyond end of the cell, starting from the third branch of subcostal near its base; median vein straight, three-branched, two upper from beyond end of the cell; submedian slightly recurved. Hind wing long, broad, apex produced, the male having the scales on the disk raised and rough; two subcostal and two median branches beyond end of the cell; discocellulars bent inward, upper the longest. Body long, slender, extending beyond hind wing. Antennæ minutely pectinate in male, setose in female. Palpi prominent, pilose at base, apex slender. Legs long, slender.

CAPISSA INNOTATA. (Plate II. fig. 2, ♂.)

Lithosia innotata, Butler, Trans. Ent. Soc. 1877, p. 352.

N.W. Himalayas.

This genus will also include *L. vagesa*, Moore, from the Khasia hills, *L. insolita*, Walk., from China, *L. nigripars*, Walk., from N. India, and *L. sambara*, Moore, from Java.

CAPISSA AURIFLAVA, n. sp.

Female. Fore wing deep golden-yellow; hind wing and abdomen paler. Underside of fore wing greyish at the base; femur, tibia, and tarsal joints with a black terminal band; palpi black at tip; antennæ yellow.

Expanse $1\frac{8}{12}$ inch.

Katmandu, Nepal (*General Ramsay*). In coll. F. Moore.

Allied to *C. vagesa* (*Lithosia vagesa*, Moore, Catal. Lep. E.I.C. ii. p. 304), but is of a deeper colour, and the legs are banded only with black, whereas in *C. vagesa* the legs are entirely black.

CAPISSA PALLENS, n. sp. (Plate II. fig. 3.)

Female. Pale whitish ochreous; fore wing glossy, costal edge ochreous. Thorax, palpi, and abdomen beneath ochreous; legs dusky brown above; palpi brown at tip; antennæ brown. Underside—costal border of both wings brighter-coloured; middle of fore wing pale ochreous brown.

[1] Probably a sound-producing apparatus.

Expanse $1\frac{5}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

Somewhat allied to *C. insolita* (*Lithosia insolita*, Walker, Catal. Lep. Het. B. M. ii. p. 497).

CAPISSA FLAVENS, n. sp.

Female. Glossy straw-yellow; hind wing and abdomen above slightly paler; apex of palpi, fore legs above, a terminal spot on middle and hind femora, and tarsi dusky brown.

Expanse $1\frac{1}{8}$ inch.

Saidabad, Cashmere (*Hellard*). In coll. F. Moore.

CAPISSA FASCIATA, n. sp. (Plate II. fig. 4, ♂.)

Male. Upperside ochreous yellow; fore wing with a brown-speckled fascia along the posterior border and about the disk; hind wing and base of abdomen pale yellow; antennæ, apical joint of palpi, and legs above brown.

Expanse $1\frac{4}{12}$ inch.

Ceylon. In coll. F. M. Mackwood.

DOLGOMA, n. g.

Male and female. Wings moderately long and broad. Fore wing with the subcostal vein bent at its second branch, five-branched, first branch curving upward but free from costal, second starting before end of the cell, curved upward, third trifurcate, lowest branch at one third its length beyond the cell; upper discocellular erect, lower oblique and bent inward; radial starting from the middle; two upper median branches at less than one fourth from end of the cell, lower branch angled and with a slight spur near its base. Hind wing—subcostal branches at one third and median branches at half distance beyond the cell.

Type, *D. reticulata* (*Lithosia reticulata*, Moore, P. Z. S. 1865, p. 798).

Darjiling.

DOLGOMA ANGULIFERA.

Lithosia angulifera. Feld. Nov.-Reise Lep. pl. 106. f. 12 (1868).

Male and female. Luteous; fore wing sparsely brown-speckled, crossed by a brown-speckled discal band, which is bent outward beyond end of the cell; hind wing pale luteous white. Underside paler-coloured.

Expanse, ♂ $1\frac{1}{12}$, ♀ $1\frac{1}{12}$ inch.

Darjiling. In coll. F. Moore.

DOLGOMA BRUNNEA, n. sp. (Plate II. fig. 8.)

Male. Cinereous brown; fore wing uniformly dark-coloured; hind wing paler. Underside paler than above; costal border of fore wing, and legs beneath, yellowish.

Expanse 1 inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Mithuna, n. g.

Wings short, rather broad. Fore wing arched, apex pointed; first branch of subcostal vein arising near end of the cell, short, oblique, anastomosing with costal but free at its end; second branch quadrifid, the upper and lower branches starting together at one third beyond the cell; upper discocellular very short, lower curved inward; radial from lower end of upper discocellular; two upper median branches starting at half distance beyond the cell, lower branch straight from one third before its end. Hind wing with subcostal and median branches at nearly one half length beyond the cell. Body short. Palpi small, pilose beneath. Antennæ setulose. Legs smooth.

Mithuna quadriplaga, n. sp. (Plate II. fig. 9.)

Fore wing luteous brown, with a distinct dusky-brown median transverse band, which is angled outward at end of the cell, a similar band also crossing the disk; outer margin with a series of dusky spots, which also indistinctly cross the cilia: hind wing pale luteous brown. Underside paler. Head and thorax brown.

Expanse 1 inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Cossa, Walker.

Cossa, Walk. Catal. Lep. Het. B. M. pt. xxxii. p. 232 (1864).

Male and female. Wings somewhat broad. Fore wing arched along the costa; first subcostal branch short, very oblique, anastomosed to costal, second free, third from end of the cell, trifurcate; discocellulars very oblique, angled at ends; radial from upper angle; two upper median branches from one third beyond the cell.

Type, *C. basigera*, Walk. *l. c.*

S. India.

Cossa quadrisignata, n. sp. (Plate II. fig. 10.)

Male. Fore wing dark purplish brown, with slightly paler streaks along the veins; costal border pale purplish cinereous, with two prominent short black streaks; a small spot at end of the cell: hind wing and abdomen above pale brownish cinereous; anal tuft slightly ochreous; thorax, head, abdomen beneath, and legs brown. Underside pale cinereous brown; middle of fore wing brown.

Expanse $1\frac{1}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

Cossa pallida, n. sp.

Male. Pale greyish ochreous: fore wing with two prominent short black broad streaks on the costa, the first subbasal, the other slightly beyond the middle; a short, narrow, black streak at end of the cell: hind wing with a very indistinct dusky submarginal fascia. Abdomen greyish, tuft ochreous. Underside pale yellowish ochreous; middle of fore wing ochreous brown. Legs greyish brown above.

Expanse $1\frac{1}{2}$ inch.

Dharmsala (N.W. Himalaya). In coll. F. Moore.

COSSA BRUNNEA, n. sp. (Plate II. fig. 11.)

Female. Fore wing dark purple-brown, with a small black spot at end of the cell, and a short black streak on the costa near the middle: hind wing paler. Thorax, head, and legs dark brown. Underside with the margins paler.

Expanse $1\frac{1}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

RANGHANA, n. g.

Female. Fore wing very long, narrow; costa arched, apex pointed, exterior margin very oblique, angle and posterior margin rounded; subcostal vein five-branched, first branch short, arising immediately above end of the cell, and joining the costal, second and third at equal distance from first, third trifurcate; radial from below subcostal beyond the cell at equal distance between first and second branches; cell short; discocellulars straight; median vein straight, three-branched, two upper at one third from the exterior margin, lower recurving from below end of the cell; submedian veins extending to posterior angle. Hind wing long, narrow; subcostal branches at half length beyond the cell; cell short; discocellulars deeply curved; median straight, two-branched. Body short. Palpi very short, stout. Legs long, slender; middle and hind tibiæ spurred. Antennæ setose.

RANGHANA PUNCTATA, n. sp. (Plate II. fig. 12.)

Female. Pale ochreous-buff colour; fore wing with a marginal and apical series of nine small black spots. Underside paler, without marks.

Expanse $1\frac{1}{8}$ inch.

Calcutta (*Atkinson*). In coll. Dr. Staudinger.

TEGULATA, Walker.

Tegulata, Walk. Journ. Proc. Linn. Soc. 1862, p. 110.

Female. Fore wing with a convex protuberance on middle of the costa; apex pointed; first subcostal branch short, anastomosed to costal, second from angle before end of the cell, third trifurcate, lowest or fifth branch nearest base; discocellulars angled at each end; radial from upper angle below end of the cell; median vein three-branched, two upper one-third beyond the cell.

Type, *T. tumida*, Walk. *l. c.*, from Borneo.

TEGULATA BASISTRIGA, n. sp. (Plate II. fig. 5.)

Female. Upperside pale luteous brown: fore wing brightest at the apex, slightly brown-speckled; a black streak along base of costal edge and along base of posterior margin: hind wing pale brownish fawn-colour externally. Underside darker. Legs brown above.

Expanse 1 inch.

Ceylon. In coll. Dr. Staudinger.

Allied to *T. tumida*, Walk.

TEGULATA PROTUBERANS, n. sp. (Plate II. fig. 6.)

Female. Upperside pale luteous brown; fore wing with numerous brown speckles and a dark brown prominent costal spot; hind wing and abdomen pale luteous-yellow. Underside paler; middle of fore wing brownish.

Expanse $1\frac{2}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

GROUP B. A. *Hind wing with a recumbent plumose lappet.*

NISHADA, n. g.

Male and female. Fore wing somewhat short, broad, costa considerably arched, apex very acute; exterior margin oblique and slightly convex; posterior margin short, in the male convex and fringed to near the base; subcostal vein five-branched, first branch arising at half length of the cell and slightly touching the costal vein, second at one third before end of the cell, third at some distance beyond the cell, fourth bifid at half its length; cell narrow; discocellulars very slender, upper short, lower obliquely curved inward; radial starting from lower end of upper discocellular; median vein three-branched, the two upper at nearly half distance beyond end of cell, lower before its end; submedian vein recurved upwards from the base. Hind wing in the male very short and broad, somewhat quadrate, anterior margin produced upward from the base and folded over onto the underside, and there provided with a long recumbent fan-like plumose covering or appendage[1]; the hind wing in the female is longer, being of the same length as posterior margin of fore wing, its anterior margin nearly straight, and is without the folded plumose appendage; costal vein following the anterior margin beneath the fold in the male; subcostal vein two-branched, the upper arising near base of the wing; cell broad; discocellulars recurved; median vein straight, two-branched, the branches very close together, lower branch from before end of the cell; submedian straight. Antennæ minutely and finely pectinate in male, setose in female. Body slender, extending beyond hind wing. Legs stout, smooth; fore femora thickened; middle and hind tibiæ spurred. Palpi small, porrect, projected slightly beyond the head, pilose beneath, apex small, pointed.

NISHADA FLABRIFERA, n. sp.

Male and female. Yellowish ochreous, palest in female; fore wing in male brighter ochreous, and slightly ferruginous at the base; thorax, head, and antennæ brownish ochreous.

Expanse 1 inch.

Calcutta District (*Farr*). In coll. F. Moore.

Allied to the Bornean *Lithosia rotundipennis*, Walk. Journ. Linn. Soc. Zool. vi. p. 104, which species is also probably identical with *L. chilomorpha*, Snellen Van Voll., Tijd. voor Ent. 1877, p. 67, pl. 5. fig. 1, from Sumatra. Both of these species will come into the genus *Nishada*.

[1] Probably a sound-producing apparatus.

GROUP B. B. *Fore wing with a recumbent plumose lappet.*

TEULISNA, Walk.

Teulisna, Walk. Journ. Proc. Linn. Soc. 1862, p. 109.

Male. Wings somewhat short and broad. Fore wing—costa depressed at the base, arched in the middle; apex pointed, exterior margin oblique, angle acute; posterior margin very convex towards the base; first subcostal branch short, anastomosed to costal; second free; third from end of cell, trifurcate; radial from third submedian branch at a considerable distance beyond the cell; cell folded over at base and overlapped for half its length by a recumbent plumose appendage[1]; discocellulars very oblique; median three-branched, two upper at some distance beyond the cell.

Female without the fold and plumose tuft.

Type, *T. plagiata*, Walk. Journ. Linn. Soc. 1862, p. 109, from Borneo.

TEULISNA TENUISIGNA, n. sp. (Plate II. fig. 13.)

Male. Yellow. Differs from the same sex of *T. tetragona* in its smaller size, being also narrower in both wings. Fore wing with a lengthened black band beneath the cell, the upper end of which is straight, and the basal end very oblique and truncated; a small spot on costa before the apex; cilia slightly blackish at the apex. Middle of thorax, tegulæ, and front of head black; fore legs dusky above.

Expanse $1\frac{3}{10}$ inch.

Sikkim. In coll. F. Moore.

MACOTASA, n. g.

Male. Fore wing narrow; costa slightly raised beyond the middle; costal vein raised, with a recumbent plumose tuft overlapping basal half of the folded cell beneath[1]; subcostal five-branched, first short, oblique, anastomosed to costal, second starting at some distance before end of the cell, third starting from second near its base and bent downward and touching end of the cell, bifurcate near its end, fifth starting in a straight line from end of the cell; discocellulars straight, nearly erect; radial starting in a straight line from lower end of the cell; median three-branched, the two upper at some distance apart below the radial and parallel to it, the base starting from below end of the cell in a line with the discocellulars; lower median branch from near base of cell, deeply curved. Hind wing somewhat narrow, apex pointed; two subcostal branches at one third beyond the cell; two upper median branches near its end. Antennæ minutely setulose. Palpi small, ascending. Legs slender.

Female. Fore wing not folded or plumed; radial starting from upper end of the cell; two upper median branches straight from beyond end of the cell.

[1] Probably a sound-producing apparatus.

MACOTASA BIPLAGELLA. (Plate II. fig. 14.)

Œcophora biplagella, Walk. MS.

Upperside pale whitish luteous: fore wing with a dark brown median costal streak, which is indistinctly continued as a narrow band across the wing, the streak more prominent and larger in the male; apex also brown-streaked: hind wing whitish at the base.

Expanse, ♂ $1\frac{1}{12}$, ♀ $1\frac{2}{12}$ inch.

Borneo. In coll. British Museum and F. Moore.

ZADADRA, n. g.

Male. Fore wing shortened, distorted, and crumpled at the apex; costa arched beyond the middle, apex very convex, exterior margin very oblique hindward, posterior margin shortened and very convex; cell very long, folded and overlapped above with a short tuft of recumbent plumes its entire length[1]; subcostal and median veins contiguous, the branches being near apex of the wing; discocellulars very convex; subcostal at some distance from costal, first branch recurved upward from end of the cell, second starting from near base of the first, bifurcate near the end, fourth before end of the cell and touching the second near its base, fifth branch and radial from end of cell; median vein three-branched, two upper beyond end of the cell, lower recurving from end near and parallel to upper branch; submedian boldly recurved. Hind wing long, broad; apex much produced; exterior margin recurved; cell long; upper discocellular long, inwardly oblique, lower very short and outwardly oblique; subcostal bifid from end of cell; median three-branched, two upper beyond end of cell, lower at half its length; submedian nearly straight. Body slender, longer than hind wing. Antennæ minutely and finely bipectinate. Legs long, smooth, spurred. Palpi slender, porrect; base pilose; apex long.

Female. Wings longer; cell of fore wing not folded or tufted, and the apex not crumpled; hind margin much less convex, and the submedian less recurved.

ZADADRA DISTORTA. (Plate II. fig. 15.)

Lithosia distorta, Moore, P. Z. S. 1872, p. 572.

Darjiling. In coll. F. Moore.

PRABHASA, n. g.

Wings long. Fore wing narrow, very slightly arched before the apex; exterior margin oblique, slightly convex; posterior margin long, nearly straight; subcostal vein at some distance from costal, first branch short, curving upward to costa before end of the cell, second straight from end of the cell, third contiguous at base to the second, trifurcate, looped to second near base; cell long, in the *male* folded and tufted with recumbent plumes above to beyond half its length[1]; discocellulars long, convex; radial from lower part; median vein three-branched, two upper curving hindward from lower end of the cell, lower curving from below the cell at nearly half its length;

[1] Probably a sound-producing apparatus.

submedian recurved. Hind wing produced at the apex; exterior margin recurved; abdominal margin short; subcostal two-branched beyond the cell; discocellulars concave; cell short, broad; median vein three-branched, two upper branches at half distance beyond the cell, lower from before half its length; submedian nearly straight. Body slender, longer than hind wing, tufted in male. Antennæ slender, with very fine delicate pectinations. Legs slender, long, smooth, spurred. Palpi slender, long, slightly ascending beyond front of head.

PRABHASA VENOSA, n. sp. (Plate II. fig. 16, ♂.)

Male and female. Upperside pale luteous brown: fore wing with the veins darker brown; an indistinct brown transverse discal band, which is bent outward beyond the cell; male with a greyish-brown plumose tuft overlapping and extending half the length of the cell; anal tuft in male ochreous. Underside paler; band across fore wing not visible.

Expanse, ♂ $1\frac{1}{10}$, ♀ $1\frac{3}{10}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

PRABHASA FLAVICOSTA, n. sp. (Plate II. fig. 17.)

Female. Upperside uniformly dark luteous brown: hind wing and abdomen purplish brown: fore wing with the costal border pale yellow; discal band most prominent at costal end, broad, but not bent outward. Front of head, thorax at sides, palpi and abdomen beneath, yellow; legs above cinereous brown, yellowish beneath. Underside uniform brown; costal border on both wings yellowish.

Expanse $1\frac{3}{10}$ inch.

Cherra Punji (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

PRABHASA COSTALIS, n. sp.

Male and female. Whitish testaceous: fore wing with the costal border whitish, and a brown spot one third before the apex; lower part of wing brown-speckled, most distinct along the veins. Underside—fore wing testaceous brown, dark-speckled along the base of costa and subcostal vein. Legs dusky brown above.

Expanse, ♂ 1, ♀ $1\frac{2}{12}$ inch.

North China. In coll. F. Moore.

GAMPOLA, n. g.

Male. Wings short, broad, truncate at the apex. Fore wing arched towards the end, apical angle acute, exterior margin nearly erect, posterior angle convex and fringed; costal edge at the base folded over and fringed for a short distance[1]; cell long and narrow, folded beneath the median vein; subcostal at some distance from costal, five-branched, first short, anastomosing with costal, but free at its end, second arising at some distance before end of the cell, third trifurcate, the upper branch nearest to and at one third beyond the cell; discocellulars bent below the middle, outwardly oblique, upper longest; radial from the angle; median vein bent upward near end of cell,

[1] Probably a sound-producing apparatus.

top branch from upper angle, second from lower, third from before half length of the cell. Hind wing quadrangular; two subcostal and two upper median branches from one third beyond the cell, lower median from half its length. Antennæ finely pectinated. Palpi small, porrect. Legs slender, naked, middle and hind spurred. Body slender, short.

Female. Wings longer, not truncate at apex; fore wing not folded; veins as in male, excepting that the hind wing has, apparently, only one upper median branch.

GAMPOLA FASCIATA, n. sp. (Plate II. fig. 18.)

Male. Upperside—fore wing pale brownish ochreous, brown-speckled, the speckles composed of dark stout scales forming a fascia below the cell and across the disk. Head, thorax, and abdomen fuliginous brown; anal tuft slightly ochreous; palpi brown at tip; legs slightly brown above. Hind wing and underside paler.

Female. Fore wing not brown-speckled, with an indistinct transverse dusky maculated discal band and a small spot at posterior angle. Underside dusky at apex of fore wing.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{1}{3}$ inch.

Ceylon. In coll. F. M. Mackwood and Dr. Staudinger.

GROUP C. *Fore wing with subcostal vein* FOUR-*branched, median vein* THREE-*branched.*

PELOSIA, Hübn.

Pelosia, Hübn. Verz. bek. Schmett. p. 165 (1816).

Samera, Wallengren, Wien. ent. Mon. vii. p. 146.

Male and female. Wings rather short and broad. Fore wing with subcostal and costal veins wide apart; subcostal four-branched; first branch short, oblique, anastomosing with costal but free beyond its end; second arising at some distance before end of the cell, straight, widely separated between first and third; third bifid, at half distance from end of the cell; discocellulars bent inward, lower shortest, upper angled close to subcostal; radial from the angle of upper; two upper median branches from half distance beyond the cell, lower from half before its end. Hind wing—two branches of subcostal at one fourth, and median branches at two thirds beyond the cell.

Type, *P. muscerda* (*Lithosia muscerda*) of Europe.

GROUP D. *Fore wing with a plumose lappet-covered sac-like cavity*[1].

BIZONE, Walker.

Bizone, Walker, Catal. Lep. B. M. ii. p. 548.

BIZONE BELLISSIMA, n. sp. (Plate III. fig. 13.)

Male. Upperside—fore wing with a transverse basal and two oblique median red bands, a broad outer marginal ochreous-yellow band, and three black spots at end of the cell: hind wing and abdo-

[1] Probably a sound-producing apparatus.

men red; tuft white. Thorax white, with two red bands. Underside uniform red; cell-spots in fore wing and discocellular streak in hind wing blackish. Fore and middle legs with blackish bands. Body beneath and legs white. Palpi black at the side.

Expanse $1\frac{9}{12}$ inch.

Masuri, N.W. Himalaya (*Hutton*). In coll. F. Moore.

Bizone coccinea, n. sp. (Plate III. fig. 14.)

Male. Upperside crimson-red, the base of fore wing slightly yellow: fore wing with a subbasal and discal black band, the former bent inward and the latter outward at the costal end; three black spots at end of the cell. Thorax yellowish, banded with red; anal tuft and abdomen beneath yellow; legs yellow, with red bands. Underside of wings uniform red.

Expanse $1\frac{3}{12}$ inch.

Sikkim. In coll. F. Moore.

Bizone alba, n. sp.

Male. Upperside white: fore wing with a small basal red spot and narrow streak on base of costal edge; a black spot at end of the cell. Underside pale red, broadly on anterior margin of fore wing and narrowly on hind wing; palpi at sides and fore and middle legs with blackish bands.

Expanse $\frac{9}{12}$ inch.

North China. In coll. F. Moore.

Group E. *Aberrant. Fore wing with* five *subcostal and* four *median branches.*

Baroa, n. g.

Fore wing long, moderately broad; costa slightly arched; apex somewhat pointed; exterior margin oblique and convex; cell short, narrow; subcostal vein five-branched, first branch free, second trifurcate, the forks ascending, fourth from end of the cell; discocellulars angled at the ends; radial from upper angle; submedian four-branched, two upper from end and third from angle before end of the cell. Hind wing somewhat short, broad; apex pointed; exterior margin convex; two subcostal branches from end of the cell; three submedian branches from end and fourth before end of the cell. Body extending beyond hind wing. Palpi slender, long, pilose beneath, ascending and extending beyond the head; terminal joint blunt. Legs slender. Antennæ minutely pectinate in male, setulose in female.

Type, *Baroa punctivaga* (*Cycnia punctivaga*, Walk. Catal. Lep. Het. B. M. iii. p. 682).

Java (*Horsfield*).

Barsine, Walker.

Barsine, Walk. Catal. Lep. Het. B. M. ii. p. 456.

Barsine flammealis, n. sp. (Plate III. fig. 15.)

Fore wing yellow, mostly covered with bright-red intervening

streaks between the veins, crossed by three outwardly recurved grey-brown bands; some spots of same colour at base of the wing, and longitudinal discal streaks joining the outer band between the veins: hind wing pale pinky red. Body red; thorax with grey-brown spots. Underside—fore wing mostly red, slightly yellow on outer veins, and brighter yellow on outer margin; legs red.

Expanse 2 inches.

India. In coll. F. Moore.

Nearest allied to *B. mactans*, Butler.

BARSINE GLORIOSA, n. sp. (Plate III. fig. 16.)

Female. Upperside—fore wing ochreous red, veins broadly lined with yellow; a broad blackish well-defined subbasal cross band, a narrow discal recurved band, and an apical series of short black longitudinal streaks; two small black dots at base of wing; costal edge and cilia black: hind wing and abdomen pale pink. Thorax red, with a narrow black middle streak and two anterior spots; palpi and legs red. Underside—fore wing red, with short black costal and apical streaks; hind wing paler, apex dusky black; middle tibiæ with a black terminal streak.

Expanse 1$\frac{4}{10}$ inch.

Khasia hills (*Atkinson*). In coll. Dr. Staudinger.

Nearest allied to *B. cruciata*, Walker, from Borneo.

BARSINE PUNICEA, n. sp.

Female. Upperside—fore wing ochreous yellow, slightly reddish along the costal border; with a blackish subbasal cross band, a waved curved discal band, and an outer series of alternated long and short longitudinal streaks; cilia and apical edge of costa black: hind wing pale ochreous red, with black marginal band. Abdomen blackish, tip yellow. Underside dull ochreous red; apex of fore wing and outer margin of hind wing blackish; middle tibiæ with a terminal black streak.

Expanse $\frac{7}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

This species is nearest allied to *B. lineata*, Walk. Cat. Lep. Het. B. M. iii. p. 760, from Borneo.

BARSINE INFLEXA, n. sp. (Plate III. fig. 17.)

Male. Upperside—fore wing ochreous red, veins lined with yellow; costal edge, posterior margin, and cilia black; a black subbasal cross band somewhat thickened within the cell, the outer lower arm of which is bent inward; a narrow discal transverse maculated band, and an outer series of short streaks, one on each vein: hind wing and abdomen pale pink. Thorax and head red, streaked with yellow; legs red. Underside—fore wing red, with black apex and margins; hind wing yellowish, with dusky black apex.

Expanse $\frac{7}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

BARSINE FLAVIVENOSA, n. sp. (Plate III. fig. 18.)

Male. Upperside—fore wing red, with all the veins very broadly lined with yellow; a blackish subbasal imperfect cross band, with the lower portion of the outer arm obsolete; a curved discal band and an incurved apical series of short black streaks: hind wing, abdomen, and legs very pale pink. Underside pink, hind wing palest.

Expanse $\frac{6}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

LYCLENE, Moore.

Lyclene, Moore, Catal. Lep. E. I. C. ii. p. 300.
Cyllene, Walk. Catal. Het. B. M. ii. p. 544.

LYCLENE RUBRICOSA, n. sp. (Plate III. fig. 1.)

Male and female. Ochreous red: fore wing with dusky-black subbasal broad zigzag band, an oblique median band and zigzag outer discal band, the latter slightly confluent about its middle in the female; a small spot also at base of wing, a curved spot at end of cell, and a small series along exterior margin. Thorax black-spotted. Underside with markings on fore wing indistinct; fore and middle tibiæ with a blackish streak.

Expanse $\frac{8}{10}$ inch.

Bombay (*Dr. Leith*). In coll. F. Moore.

Allied to *L. artocarpi.*

LYCLENE ARTOCARPI, n. sp.

Male and female. Fore wing ochreous, with a dusky-grey subbasal series of short longitudinal streaks; an upright median band and outward discal oblique irregular band, both confluent on middle of the hind margin; a small blackish spot at base of wing, and an indistinct spot at end of the cell: hind wing and abdomen pale ochreous. Thorax with black spots. Underside paler, markings on fore wing less distinct; an indistinct median dusky fascia across hind wing in the female.

Expanse $\frac{6}{8}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Nearest allied to *L. humilis*, Walk. Catal. Lep. Het. B. M. ii. p. 554. "Larva feeds on the Jack tree (*Artocarpus incisa*), January."—*A. Grote, MS. note.*

LYCLENE RADIANS, n. sp. (Plate III. fig. 2.)

Male. Fore wing yellowish white, with a black basal spot, three transverse series of spots, each composed of three, and the middle series curved; a prominent spot at end of the cell, and a marginal series of broad black lines, one on each vein, their inner ends confluent and forming a bordered line, which is bent outward at its middle: hind wing with a less prominent series of short black marginal lines, which do not extend to the anal angle. Body ochreous yellow. Underside similarly marked, the basal spots on fore wing

less distinct; hind wing with two indistinct spots from middle of the costa; legs black-streaked.

Expanse 1 inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

LYCLENE DELICATA, n. sp.

Female. Pale yellow: fore wing with some small black subbasal spots, a median transverse narrow line, a lunule at end of the cell, a discal recurved series of small spots, one on each vein, and an outer marginal series of very narrow black streaks, one on each vein: hind wing with a marginal series of very narrow black streaks, one on each vein. Underside with the outer marginal series of streaks and median line as above, the median line extending partly across hind wing; femora, tibiæ, and tarsi with black terminal streak.

Expanse $1\frac{1}{5}$ inch.

Darjiling (*Grote*). In coll. F. Moore.

Allied to *L. radians*. Differs in having all the markings much narrower, in addition to the median transverse line on the fore wing. From *L. prominens* it also differs in the more slender markings, and in the absence of the sharp dentate discal line.

LYCLENE PROMINENS, n. sp. (Plate III. fig. 3.)

Male and female. Upperside ochrey yellow: fore wing with four black basal spots, a bent transverse subbasal line, a wavy median line, a narrow oblique spot at end of the cell, an irregular discal band with two sharply dentate points beyond the cell, and an outer marginal series of longitudinal streaks, one on each vein: hind wing with a marginal series of short black longitudinal streaks. Two black spots on middle of thorax. Underside marked as above, the median and discal lines broader, the former extending across hind wing; abdomen with black bands beneath; legs with black bands.

Expanse, ♂ 1, ♀ $1\frac{3}{12}$ inch.

Cherra; Khasia hills (*G.-Austen*). In coll. F. Moore.

LYCLENE ZEBRINA, n. sp. (Plate III. fig. 4.)

Male. Upperside yellowish white: fore wing with brown basal linear spots, a median transverse line, a small spot at end of the cell, and a wide outer marginal series of narrow streaks: hind wing with a brown marginal band. Underside with broader markings than above, the middle line crossing the hind wing; marginal streaks in place of the band.

Expanse $\frac{8}{10}$ inch.

Calcutta District (*Farr*). In coll. F. Moore.

LYCLENE PALMATA, n. sp. (Plate III. fig. 5.)

Female. Upperside pale ochrey yellow: fore wing with two bluish basal spots, a transverse linear series of three spots, a median maculated purple line, and a broad fan-shaped discal series of longitudinal purple streaks decreasing in length to middle of hind margin: hind wing with some short purple apical streaks. Underside marked as

above, the basal spots less distinct; tibiæ with black terminal band.

Expanse $1\frac{2}{10}$ inch.

N.E. Bengal. In coll. F. Moore.

LYCLENE INTERSERTA, n. sp. (Plate III. fig. 6.)

Female. Upperside—fore wing ochrey yellow, with a short black streak at the base, narrow subbasal transverse bent line, a discal line which is convex anteriorly and bent posteriorly; between these is an oblique-angled line, the point being opposite to the angle of the subbasal line; an upper and lower longitudinal line, the former along the cell, the latter below it and furcate, the forks bent backward; also an outer marginal confluent looped line; cilia black, with white border: hind wing pale yellow; cilia at apex black. Thorax and head yellow, with black streaks; palpi and legs above blackish; abdomen paler yellow. Underside uniform yellow, markings indistinct.

Expanse $1\frac{3}{10}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

Near to *L. euprepioides*, Walk.

LYCLENE OBSOLETA, n. sp. (Plate III. fig. 7.)

Female. Yellow: fore wing slightly ochreous yellow externally; with several purplish-brown subbasal spots, a deeply sinuous discal band, and outer contiguous series of spots: hind wing and abdomen yellow. Underside paler; markings on fore wing indistinct; hind wing with a short costal streak before the apex; fore tibiæ with a blackish terminal streak.

Expanse $\frac{8}{10}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

May be distinguished by the absence of the median transverse band between the subbasal spots and sinuous band.

LYCLENE DISCISTRIGA, n. sp.

Male and female. Fore wing yellow, with black basal speckled spots, a median transverse recurved narrow band, an oblique spot at end of the cell, a discal series of narrow longitudinal streaks, and a marginal series of small spots: thorax black-spotted: hind wing paler. Underside pale yellow; markings on fore wing very indistinct.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{3}{4}$ inch.

Darjiling. In coll. F. Moore.

Allied to the Bornean *L. strigipennis*, H. S. Lep. Spec. Nov. f. 437.

LYCLENE INCONSPICUA.

Male. Pale ochreous red, semidiaphanous: fore wing with oblique transverse basal and median indistinct dusky band, and discal streaks, one along each vein and terminating in a marginal spot: hind wing

with a slight dusky apical streak. Underside—fore wing with the discal markings confluent. Legs with dusky streaks.

Expanse $\frac{9}{12}$ inch.

Northern India (*Farr*). In coll. F. Moore.

LYCLENE TERMINATA.

Male. Upperside pale yellow; fore wing with black irregular basal streaks, an oblique recurved narrow median transverse line, an oblique streak at end of the cell, and a discal series of narrow elongated streaks, one on each vein and terminating in a spot at the outer margin. Underside of fore wing as above. Legs black-streaked.

Expanse $\frac{9}{12}$ inch.

Khasia hills (*G.-Austen*). In coll. F. Moore.

LYCLENE ASSAMICA. (Plate III. fig. 8.)

Male. Pale yellow. Upperside—fore wing with a purple-brown basal spot, two subbasal transverse series of spots, a spot at end of the cell, and a discal dentate band, each point having a terminal spot which forms a submarginal series. Thorax black-spotted.

Expanse $\frac{8}{12}$ inch.

Dibrughur, Assam (*Atkinson*). In coll. Dr. Staudinger.

Allied to both *L. undulosa* and the Bornean *L. cuneigera*, Walk.

LYCLENE SPILOSOMOIDES, n. sp.

Male. Upperside yellowish white; fore wing with two black spots at the base and one on the costa, a subbasal and discal recurved series of smaller linear spots, one on each vein. Body yellowish, tuft brighter; a black spot on each tegula; palpi and band on lower part of vertex brown. Underside uniformly paler, without markings.

Expanse $1\frac{7}{12}$ inch.

N.W. India. In coll. F. Moore.

LYCLENE INDISTINCTA, n. sp. (Plate III. fig. 9.)

Female. Fore wing dull yellow, with two very indistinct subbasal curved series of pale brown spots, a bent discal series of spots, and an outer series of short longitudinal streaks: hind wing and underside much paler; fore tibiæ cinereous-brown above.

Expanse $1\frac{11}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

ÆMENE, Walker.

Æmene, Walker, Catal. Lep. B. M. ii. p. 542.

ÆMENE MACULIFASCIA, n. sp. (Plate III. fig. 10.)

Male. Fore wing white, crossed by six black maculated bands; the first basal; second curved; third and fourth discal, irregular, and with dusky-brown suffused interspace; the other two marginal; two spots within the cell, the one at the end largest; cilia spotted near apex: hind wing ochreous-white. Thorax black-spotted;

palpi black; fore legs black-streaked. Underside—fore wingbrown, spots slightly visible; hind wing with a brown spot at end of the cell, an indistinct submarginal fascia and spots on cilia near apex.

Expanse $1\frac{1}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger.

ÆMENE SINUATA, n. sp. (Plate III. fig. 11.)

Male. Upperside ochreous white: fore wing with five narrow black sinuous bands, a spot within and a lunule at end of the cell, and an outer marginal row of small spots; cilia with a black line and three widely separated spots: hind wing pale brownish-grey; cilia brown-lined; a black terminal spot on tegulæ. Underside brownish grey, markings on fore wing indistinct; hind wing with pale brown spot at end of the cell, and a submarginal fascia; palpi black; fore legs black-streaked.

Expanse 1 inch.

Cherra Punji (*Atkinson*). In coll. Dr. Staudinger.

ÆMENE SUBCINEREA, n. sp.

Allied to *Æ. taprobanis*; the fore wing greyish-ochreous, with markings more like those in *Æ. guttulosana*, but smaller and narrower; hind wing and abdomen cinereous. Underside cinereous-brown.

Expanse $\frac{7}{8}$ inch.

N.W. India. In coll. F. Moore.

ÆMENE MODESTA, n. sp.

Male. Nearest to *Æ. guttulosana*, Walk., from Bombay, but smaller in size, darker in colour, and the hind wing pale fuliginous; the markings on the fore wing much smaller, the spot at end of the cell narrow and lunular, and the sagittate mark below it nearly obsolete.

Expanse $\frac{8}{12}$ inch.

Formosa (*Swinhoe*). In coll. F. Moore.

ÆMENE TENEBROSA, n. sp.

Male and female. Fore wing hoary black, the grey scales prominent, with some black spots on the costa within and below the cell, and on the exterior margin; hind wing and abdomen cinereous-grey. Thorax hairy, black. Underside dark cinereous-grey; apex of fore wing ochreous; legs blackish above.

Expanse, ♂ $\frac{8}{12}$, ♀ $\frac{9}{12}$ inch.

Bombay. In coll. F. Moore.

Allied to *Æ. sordida*, Butler, Trans. Ent. Soc. 1877, p. 372, but is a very much darker insect.

SETINA, Schrank.

SETINA PUNCTILINEA, n. sp.

Male. Upperside—fore wing yellow; a black streak on base of costal margin, a spot below it, two small very indistinct subbasal

spots, one at end of the cell, and a more prominent marginal row of spots: hind wing and abdomen pale yellow. Thorax black-spotted; legs black, streaked above.

Expanse $\frac{10}{12}$ inch.

Ceylon. In coll. F. M. Mackwood and F. Moore.

Allied to the European *S. irrorella*.

SETINA DISCISIGNA, n. sp.

Female. Upperside pale yellow: fore wing tinged with ochreous along hind margin; a black spot near base, a smaller spot at base of costa, and a more prominent spot at end of the cell: hind wing suffused with purplish-brown near the apex and along abdominal margin. Thorax and head yellow, both with black spots; abdomen and legs purplish-brown, tip yellow. Underside—middle of fore wing dusky brown.

Expanse 1 inch.

Cherra (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

SETINA NEBULOSA, n. sp.

Female. Upperside—fore wing yellow; with a black basal spot, a broad irregular-bordered discal ochreous-brown band and confluent subbasal irregular-shaped band: hind wing cinereous white, with broad dusky indistinct submarginal fascia. Thorax yellow; abdomen cinereous-white. Underside and legs paler.

Expanse $1\frac{2}{12}$ inch.

Darjiling (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

SETINOCHROA, Felder.

Setinochroa, Feld. Nov. Voy. iv. pl. 106.

SETINOCHROA AURANTIACA, n. sp. (Plate III. fig. 12.)

Male. Upperside bright orange-yellow: fore wing with a black basal spot, two subbasal, a large spot at end of the cell, and a recurved submarginal series of four or five spots: hind wing ochreous-brown externally. Thorax black-spotted; abdomen greyish-brown, tip yellow. Underside—middle of the fore wing ochreous brown, base of costa and subapical streaks black; hind wing black-bordered at apex.

Expanse $\frac{10}{12}$ inch.

Khasia hills (*G.-Austen*). In coll. F. Moore.

Allied to *S. infumata*, Feld. Nov. Voy. iv. pl. 106. fig. 16, but differs in being of a different yellow in colour, in the fore wing having the subbasal spots, and the hind wing having only a marginal blackish border.

SETINOCHROA PALLIDA, n. sp.

Male. Upperside—fore wing pale yellow, with small black spot at base, one at end of the cell, and a submarginal series of spots: hind wing pale ochreous-brown externally. Underside—fore wing pale ochreous-brown in the middle; cell and apical spots very indistinct.

Expanse $\frac{9}{12}$ inch.

Manpuri, N.W. India (*Horne*). In coll. F. Moore.

Differs from *S. infumata* in the wings being narrower, and of a paler colour both above and beneath.

SETINOCHROA POSTICA, n. sp.

Male. Upperside bright ochreous-yellow: fore wing with a small black spot at base, a prominent spot at end of the cell, and a recurved submarginal series: hind wing slightly brownish-ochreous, with a distinct black streak at end of the cell. Underside—fore wing ochreous-brown in the middle, with black apical spots; cell-streak in hind wing.

Expanse $\frac{1}{2}^0$ inch.

Dhurmsala, N.W. Himalayas. In coll. F. Moore.

NUDARIA, Haw.

Nudaria, Haw. Lep. Brit. p. 156.

NUDARIA FASCIATA, n. sp.

Male and female. Pale yellow, diaphanous: fore wing with a broad purple-brown band from the costa, decreasing to middle of hind margin, and lunular streaks on exterior margin; hind wing paler, slightly suffused with purple-brown at the base. Body yellowish-white; legs purple-brown above.

Expanse $\frac{1}{2}^0$ inch.

Darjiling (*Atkinson*). In coll. F. Moore.

Allied to *N. margaritacea*, Walk.; but that species differs in having the fore wing crossed by four distinct irregular sinuous bands.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. *Paraona splendens*, p. 8.
2. *Sidyma apicalis*, n. sp., p. 9.
3. *Mahavira flavicollis* ♂, n. sp., p. 11.
4. *Hesudra divisa* ♂, n. sp., p. 12.
5. *Vamuna maculata* ♂, n. sp., p. 10.
6. *Chrysæglia ferrifasciata* ♂, n. sp., p. 13.
7. *Gandhara serva*, p. 15.
8. *Tarika varana*, p. 15.
9. *Brunia antica*, p. 15.
10. *Ghoria albocinerea*, n. sp., p. 13.
11. *Vamuna bipars* ♂, n. sp., p. 10.
12. *Churinga rufifrons* ♂, n. sp., p. 10.
13. *Collita parva*, n. sp., p. 16.
14. *Katha terminalis*, n. sp., p. 17.
15. —— *nigrifrons*, n. sp., p. 17.
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PLATE II.

Fig. 1. *Chrysorabdia viridata* ♂, p. 19.
2. *Capissa innotata* ♂, p. 19.
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4. —— *fasciata* ♂ n. sp., p. 20.
5. *Tegulata basistriga*, n. sp., p. 22.
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Fig. 7. *Systropha auriflua*, n. sp., p. 18.
8. *Dolgoma brunnea*, n. sp., p. 20.
9. *Mithuna quadriplaga*, n. sp., p. 21.
10. *Cossa quadrisignata*, n. sp., p. 21.
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PLATE III.

Fig. 1. *Lyclene rubricosa*, n. sp., p 30.
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2. On Birds collected in Costa Rica.

By ADOLPHE BOUCARD, C.M.Z.S.

[Received Nov. 15, 1877.]

(Plate IV.)

Costa Rica, the most southern of the five Republics known together under the name of "Central America," is said to contain 150,000 inhabitants, of which 100,000 live in the valleys of San José and Cartago. The remainder of the population is widely distributed in small villages, some of them lying at great distances from each other. Thence the difficulty of travelling in the interior of the country.

I arrived at Puntarenas, the Pacific port, on the 29th of December 1876, and remained in the country till the 30th May 1877—in all, five months.

My head quarters were San José, the capital. It is situated in the centre of a very fertile valley, about midway between the Atlantic and the Pacific, at the altitude of 4100 feet. It is said to contain 15,000 inhabitants. My intention was to take a house; but the rent, furniture, and servants were so dear that I stopped all the time at the Hotel Victor, where I was recommended to go.

My hunting-ground during the first weeks was in the valley of San José; but I was rather disappointed, birds being very scarce, which was due chiefly to the poverty of the vegetation, all the soil for many miles having been turned into coffee-plantations. The only places for hunting were the roads from San José to the towns and villages of Heredia, Alajuela, Tres Rios, Desamparados, &c.

On the trees and shrubs surrounding the coffee-plantations small flocks of birds were flying about. These flocks consisted of the following species—*Pyrgisoma cabanisi, Zonotrichia pileata, Buarremon chrysopogon, Saltator grandis, Catharus melpomene, Turdus grayi, Cyclorhis flavipectus, Elainea pagana, Myiarchus crinitus,* and several other species of Tanagridæ, Fringillidæ, and Tyrannidæ.

Among the Trochilidæ *Pyrrhophæna riefferi, Saucerottia sophiæ,* and *Chlorolampis osberti* were the only three species to be seen at that time.

In the gardens and maize-fields several species of *Spermophila* were found feeding on seeds.

In the barrancas (deep ravines occasioned by the large quantity of water which falls in the rainy season) the vegetation was more varied, and several species of Columbidæ were met with. In all parts of the valley you always find the same species.

At the end of January, I made an excursion to the valley of San Carlos, in company with MM. Koschny and Meil de Fontenay, who proved to be very good travelling companions. The valley of San Carlos divides the Republic of Costa Rica from that of Nicaragua. It lies on the Atlantic slope, and extends as far as the river San Juan, which is the boundary of the two countries. It is quite a tropical climate, and considered very unhealthy. The forests are of the most magnificent description. There are scarcely any roads or inhabitants, except four or five settlers who are trying to raise cattle, and some few Nicaraguans who are engaged in extracting the juice of the india-rubber tree (*Siphonia elastica*).

To reach San Carlos we had to pass Sarzero and Laguna, two small villages lying at the summit of the Cordillera, near the volcano of Poas. Thence we had to descend gradually about 5000 feet through a very picturesque country.

We arrived the third day, at twelve, at the rancho where we intended to stop. From this rancho you can reach Greytown by water in little more than half a day. The return takes about six days, as you have then to go against the current.

The animal life is prodigious; flocks of birds are constantly passing to and fro. Early in the morning and at sunset large quantities of Howling Monkeys (*Mycetes palliatus*) are heard all around. They make a fearful noise; and one who has not heard them before may well fancy that the forest is thronged with Jaguars. These last-mentioned animals used to be very common; but now they are rather scarce, having been much persecuted.

Large flocks of *Ara macao, Chrysotis farinosa, Pionus senilis, Conurus astec,* and other species of Parrots are constantly passing in all directions.

This excursion lasted a fortnight. During that time I made a good collection of bird-skins, amongst them a female of the rare Cotingine bird, *Carpodectes nitidus*, quite new to science; also many other good species, as *Myrmotherula melæna*, *Urospatha martii*, *Prionirhynchus carinatus*, *Crypturus boucardi*, &c.

All the time I had to work at a great disadvantage. On the trunk of a tree I prepared my skins, with an empty box for a seat. Pigs and ants were always ready to do mischief; and I lost several good specimens of birds by pigs devouring them when they were drying in the sun.

My other excursions were to Cartago, Aguas Calientes, Navarro, Orozi, the Volcano of Irazu, Candelaria, Naranjo, &c.

Cartago is a town of about 10,000 inhabitants. It was formerly the capital; but owing to the frequent earthquakes felt there, and the great destruction of property occasioned by the same, the government was transferred to San José. The town is built at the base of the Volcano of Irazu, in a beautiful valley which varies from three to six miles in width and is about ten in length.

Aguas Calientes is a very prosperous village, only two miles and a half from Cartago. Although at such a short distance, it is much warmer, being well sheltered from the north wind, and about 250 feet lower.

A few miles further, going north-east, are the small villages of Navarro and Orozi, the localities for *Phainoptila melanoxantha*, *Chlorophonia callophrys*, *Geotrygon costaricensis*, *Tetragonops frantzii*, &c.; and if you still go further north, you reach Tucuriqui, the locality where Arcé procured the type-specimen (♂) of *Carpodectes nitidus*. All these localities are from 500 to 2500 feet lower than Cartago, and the fauna is very rich.

Naranjo is the name of a very important hacienda, belonging to to the Tenoco family. Lately a small village of the same name has been formed by the workmen of the hacienda. It stands on the road from San José to Limon (the Atlantic port).

This locality is very good for a naturalist, lying between the volcanoes of Irazu and Turrialba. In a few hours you can change your altitude from 1500 to 8000 feet or more if you choose; consequently there is a great variety of species to be got. The forests are luxuriant, due chiefly to the climate, which is very wet. It rains nearly all the year round. I found there many of the same species met with at San Carlos.

From Cartago I made several excursions to the Volcano of Irazu.

Up to the altitude of 6000 feet you only see maize- and wheat-plantations, occasionally some potreros (plains) where they fatten cattle, until you reach a small village called Potrero cerrado, where they cultivate potatoes extensively. A little further on begins the forest, where a species of oak tree is very abundant. Then the fauna changes entirely. You do not meet any more with the species of birds found in the valley, but such others as *Ptilogonys caudatus*, *Setophaga aurantiaca* and *S. torquata*, *Parula gutturalis*, *Pezopetes capitalis*, &c. Further on, at the altitude of from 7000 to 8000 feet

the forest is more dense, and the animal life is very abundant. This is the chief locality for *Pharomacrus costaricensis*, *Panterpe insignis*, *Dorycha bryantæ*, and *Turdus nigrescens*.

At the altitude of 8000 feet the forest ceases altogether, and you walk on scoriæ and ashes sent from the volcano of Irazu a long time ago. Many small trees and aromatic plants grow in the soil up to the summit of the mountain.

This is the locality for *Selasphorus flammula* and *S. scintilla*, which are seen sucking the flowers of mistletoes and heaths. Here also I met with my new species *Zonotrichia vulcani*. I reached the summit of the volcano, and slept there. On the other side, looking north-west, is the crater, which I have thoroughly explored.

Rancho redondo is a farm situated on the western slope of the Volcano of Irazu. It is also a good locality for *Phainoptila melanoxantha*, *Eugenes spectabilis*, *Chasmorhynchus tricarunculatus*, and other rare species.

Atenas is about thirty miles west from San José, on the road to Puntarenas.

San Mateo is on the Pacific slope, at the foot of the Aguacate mountain (rich in gold-mines), about thirty-eight miles from the port. The climate is quite tropical. Some of the species found at San Carlos are also met with here. It is also a rich locality for reptiles and insects.

Barranca is only about half a mile from the sea, and ten miles from Puntarenas. The village is built near the river of the same name.

Puntarenas is the port. Its name is very appropriate, as it stands on a sandy peninsula extending for about six miles. On one side is the sea, on the other a river; sometimes the width of this isthmus between the river and the sea is only fifty yards, and never more than one mile. It is excessively hot and unhealthy for a new comer. The vegetation is poor; but four miles from the town is a fine forest, where animal life is plentiful.

Altogether Costa Rica has been well explored by MM. Warzewicz Frantzius, Hoffmann, Ellendorf, Carmiol, father and son, Endrés, Arcé, Zeledon, Cooper, and others.

Up to this day 520 species of birds (some doubtful) are recorded as having been collected in that country; and I feel well satisfied when I think that in a country so well worked up I have been able to obtain several new species and some great rarities—such as both sexes of *Phainoptila melanoxantha*, a new genus and new species just described by Mr. Osbert Salvin, *Carpodectes nitidus* (♀), *Catharus frantzii*, *Catharus gracilirostris*, *Turdus nigrescens*, *Turdus obsoletus*, *Parula gutturalis*, *Pezopetes capitalis*, *Melozone leucotis*, *Eugenes spectabilis*, *Selasphorus scintilla*, *Selasphorus flammula*, *Oreopyra hemileuca*, *Oreopyra cinereicauda*, *Panterpe insignis*, *Conurus hoffmanni*, *Geotrygon costaricensis*, *Dendrortyx leucophrys*, *Crypturus boucardi*, &c. &c.

The total number of species which I collected is about 250; but I worked very hard to obtain this result, and until the time of my

departure I did not lose a single day, and often I had no repose from morning till night. I could easily have obtained a larger number of specimens; but I did not collect very well-known and common birds which were already well represented in my collection.

I consider Costa Rica one of the worst places for making collections, in consequence of the difficulty of transport, the bad roads, and the great expense which these deficiencies occasion. You must carry every thing with you, live and sleep as you can and where you can, sometimes in the most miserable huts, sometimes in the forest.

At first I was not able to find help at any price. A few hunters, willing to work for me at high pay, made such bad skins that I was obliged to dismiss them.

Others to whom I offered good prices for birds in the flesh never came again after I gave them powder and shot. At last, a little before my departure, I met with two good hunters, whom I employed a few days, and did very well with them; but it was rather too late, the time of my departure having arrived, and the best season for birds being over.

The classification which I have followed in the following list is that of my 'Catalogus Avium.'

Ordo Crypturi.

Family Tinamidæ.

1. Nothocercus bonapartii, Gray.

Tinamus frantzii, Lawr.

Native name "Gallina del monte." Only one specimen procured, in May 1877, at Rio Navarro, at the base of the Candelaria Mountains, twelve miles from San José.

This seems to be a rare species; the typical specimen of *T. frantzii*, Lawr., was collected at Cervantes by J. Zeledon. Cervantes is not far from Rio Navarro.

Like all Tinamidæ, it is found in the dense parts of the forest, where it feeds on insects and seeds. They can be easily detected by the noise they make when scratching the ground in search of food. They go in pairs, repeatedly calling one another. When fearing danger they run with much rapidity.

2. Crypturus boucardi, Scl.

The type of this species was from Mexico, and not from Guatemala as stated in Gray's 'Hand-list of Birds.' As well as I can remember, the first specimen (the type of this species) was obtained by me at Playa Vicente, a small village up the river Papaloapam, the mouth of which is at Alvarado, on the Atlantic, between Vera Cruz and Minatitlan.

As far as I know, all specimens of this bird have been obtained in the tropical forests a few hundred feet above the sea-level; but it is an interesting fact that this species has been obtained also in Guatemala and Costa Rica.

Only one specimen (♀) collected, at San Carlos, where it was rather abundant in February. They are rather easy to detect, in consequence of a plaintive cry which they repeat frequently, as if calling one another.

The flesh is white and delicious to eat.

I have also one specimen, obtained at San Carlos, which is much darker than *C. boucardi*. It has not any of the black and yellow spots, either on the back or on the secondaries and tertiaries, which are so conspicuous in the former. Instead of that the secondaries are nearly black, bordered with rufous grey, the tertiaries are rufous grey, the back is rather dark rufous, darker on the rump, the upper tail-coverts are rufous, with an indication of yellow and black spots, as in *C. boucardi*. On the underside the abdomen is nearly of the same grey colour as the breast, slightly rufous on each side.

Ordo Gallinæ.

Family Cracidæ.

3. Penelope purpurascens, Wagl.

Native name "Faisan."

Hab. Volcan de Irazu.

Rather common in the forests on the slopes of the volcano. It is also found in San Carlos, showing that it lives indifferently in low or high altitudes.

4. Chamæpetes unicolor, Salv.

Hab. Volcan de Irazu.

They are in great demand for food in San José, where they sell at from four to eight shillings.

Subfamily Cracinæ.

5. Crax globicera, L.

Native name "Pavo."

Hab. San Carlos, Volcan de Irazu, Naranjo.

Rather common.

Subfamily Odontophorinæ.

6. Odontophorus guttatus, Gould.

Native name "Perdiz."

Hab. Curridabat, near San José.

Two specimens, one male and one female, killed in March.

7. Dendrortyx leucophrys, Gould.

One specimen, from the Volcano of Irazu, May. Killed at the altitude of 7000 feet. It was scratching the ground in search of food.

8. Ortyx leylandi, Moore.

Valley of San José. Common in the coffee-plantations during the

rainy season, from May to December, rare in the other months; then it disappears completely from the valley. They are also met with in small flocks in the plains. They run very fast.

Ordo COLUMBÆ.

Family COLUMBIDÆ.

Subfamily COLUMBINÆ.

9. COLUMBA ALBILINEATA, Gray.

Several specimens from the Volcano of Irazu, May. Is found in flocks of ten or twelve, feeding on seeds. I have seen them coming from all directions to drink at a spring of mineral water near Desamparados.

10. COLUMBA SUBVINACEA, Lawr.

Only one specimen, from Candelaria, May. Very rare.

11. ZENAIDURA CAROLINENSIS, L.

Several specimens, from San José, January to May.

Subfamily GOURINÆ.

12. CHAMÆPELIA PASSERINA, L.

Common near San José, January to May.

13. CHAMÆPELIA RUFIPENNIS, Gray.

Very abundant at Puntarenas in May.

14. LEPTOPTILA VERREAUXI, Bp.

Several specimens from San José, January to March.

15. LEPTOPTILA CASSINI, Lawr.

Only one specimen, from San Carlos, February. Inhabits the forest. I also found two eggs of this species on a small tree. They are uniform white. The male was sitting on the eggs.

16. GEOTRYGON MONTANA.

San Carlos, February.

17. GEOTRYGON COSTARICENSIS, Lawr.

Several specimens killed on the mountain of Candelaria, at the altitude of from 3000 to 4000 feet.

Feeds on seeds, and very likely also on insects. The crop of one of the specimens dissected, and which I have here, is full of small seeds. I have always seen them on the ground, going singly. The sexes are exactly alike.

18. GEOTRYGON CHIRIQUENSIS, Sclat.

Geotrygon cæruleiceps, Lawr.

Native name "Paloma del Monte."

Volcano of Irazu and Candelaria.

This is a scarce species in Costa Rica. Like the former, it has the

same habits as the Tinamidæ and Odontophorinæ of going about on the ground. I have never seen it perched.

Ordo Limicolæ.

Family Charadriidæ.

19. Oxyechus vociferus, L.

Valley of San José.

Excessively common in the plains, where they are seen constantly running about searching for food, and even catching grasshoppers and small insects on the wing. When surprised they run very fast, at the same time crying, as if to advise one another of some danger.

Family Scolopacidæ.

20. Tringoides macularius, L.

Several specimens shot in the valley of San José. They are found along the streams, flying from one stone to another, or searching for food close to the water. When surprised they take to flight, emitting a sharp cry, similar to *pit, pit, pit.*

Ordo Herodiones.

Family Plataleidæ.

21. Platalea ajaja, L.

One specimen near San José, April.

Ordo Anseres.

Subfamily Anatinæ.

22. Dendrocygna autumnalis, L.

Native name "Pato."

Common at the laguna of Cartago, where the division of the waters takes place, either for the Atlantic or the Pacific.

Ordo Accipitres.

Family Falconidæ.

23. Micrastur semitorquatus, Vieill.

One specimen, killed in the forests of Candelaria Mountains, May.

24. Buteo latissimus, Wils.

Buteo pennsylvanicus, Wils.

One specimen, killed at San José in January.

25. Urubitinga ghiesbreghti, Du Bus.

One specimen, from Naranjo, April. Rare.

26. Thrasaëtus harpyia, L.

Native name "Aguila."

I have seen one specimen alive in San José. It was caught in the

Candelaria Mountains. It was kept in a large cage, and seems quite at home. When you approach it, it erects its crest, and presents then a very imposing sight.

27. ELANOIDES FURCATUS, L.

One specimen from Naranjo. I saw several in a place cleared for sowing. They sat motionless for hours at the top of the highest trees, probably watching for their prey.

28. LEPTODON UNCINATUS, Temm.

Native name "Gavilan."

One specimen, from Naranjo, April. This bird has a strong cry, which sounds like *oua, oua, oua*, repeated several times in succession. It resembles very much the cry of the Peacock when asking for rain (as vulgarly said). It is so loud that you can hear it at a long distance. The capture of my specimen was due to it. It was perched on the top of a high tree in the forest; and if it had not been for its cry, I do not think I should have detected it. Several of these birds were at about half a mile one from the other, and crying in succession; and it occurs to me that each one takes possession of a certain part of the forest and admits of no intruder.

29. CERCHNEIS SPARVERIUS, L.

Common in all altitudes, January to May.

Family VULTURIDÆ.

30. CATHARTES PAPA, L.

Native name "Rey de los Zopilotes."
Seen at San Mateo in May.

31. CATHARISTES ATRATUS, Barth.

Native name "Zopilote."
Common everywhere all the year round.

32. ŒNOPS AURA, L.

Native name "Zopilote de cabeza colorada."
San José, January to May.

Ordo STRIGES.

Family BUBONIDÆ.

33. SCOPS BRASILIANUS, Gm.

Native name "Lechuza."

One specimen from San José. It was perched on a small tree in company with two adult specimens. I killed the young and the female with the same shot.

34. LOPHOSTRIX STRICKLANDI, Sclat. & Salv.

San Carlos, February.

Ordo Psittaci.

Subfamily Arainæ.

35. Ara macao, L.

Native name "Guacamaya."

Common at San Carlos. Every morning they fly about in large flocks. In the daytime you can see them in the forest eating fruit; they are easily detected by the noise they make, and by the rejected pieces of fruit constantly falling down from the trees on which they are perched.

36. Ara militaris, L.

San Carlos, Sarzero, February.

37. Conurus hoffmanni, Cab.

Native name "Perico."

Several specimens killed at the foot of the Candelaria Mountains. I have also seen small flocks at Aguas Calientes, near Cartago. When flying they appear excessively beautiful: this is due principally to the conspicuous colour of their wings.

38. Conurus astec, Souancé.

Native name "Perico."

One specimen killed at San Carlos, amongst a large flock eating fruit and seeds in the forest, February.

39. Brotogerys tovi, Gm.

Native name "Periquito."

Common at San Carlos, February.

40. Pionus senilis, Spix.

Native name "Cotora."

Common at San Carlos in February. Found in company with *Conurus astec*.

41. Chrysotis farinosa, Bodd.

Chrysotis pulverulenta, Gm.

Native name "Loro."

Common at San Carlos in February.

Ordo Coccyges.

Subordo Zygodactylæ.

Family Ramphastidæ.

42. Ramphastos tocard.

Native name "Pico de canoa."

Common at San Carlos in February.

43. Pteroglossus torquatus, Gm.

Common at San Carlos in February.

44. PTEROGLOSSUS FRANTZII, Cab.

Common at San Carlos in February.

45. SELENIDERA SPECTABILIS, Cass.

Naranjo, April.

46. AULACORAMPHUS CŒRULEOGULARIS, Gould.

Naranjo, April.

All these species are found in the forests in small flocks of from ten to fifteen. They live chiefly on fruit.

Family CAPITONIDÆ.

Subfamily CAPITONINÆ.

47. TETRAGONOPS FRANTZII, Sclat.

Several specimens from Navarro, May. Found in the forests near the streams.

48. CAPITO BOURCIERI, Lafr.

Two specimens, from Orozi and Navarro.

Family BUCCONIDÆ.

49. MALACOPTILA PANAMENSIS, Lafr.

Two specimens, male and female, killed at San Carlos in February. Always seen in the forests.

Family GALBULIDÆ.

50. GALBULA MELANOGENIA, Sclat.

Common at San Carlos in February.

Family CUCULIDÆ.

Subfamily CROTOPHAGINÆ.

51. CROTOPHAGA SULCIROSTRIS, Sw.

Very common in the valley of San José on the edges of the coffee-plantations. They go in flocks of from ten to fifteen, flying from one bush to another. They do not notice the presence of man, and are commonly called "Garapatero" (eater of Garapatas, a common parasite which lives principally on cattle, and also on men). They are often seen on the back of animals, eating the insects which infest them. The cattle seem to enjoy very much the close company of this auxiliary, which does such good service for them. I have one egg of this species, which is of the size of a Pigeon's, all white.

Subfamily COCCYZINÆ.

52. COCCYZUS MINOR, Gm.

One specimen, from Puntarenas, May. This is the first time that this species is recorded from Costa Rica.

53. Piaya mehleri, Bp.

Several specimens from San José. It is called commonly "Bobo de pecho aplomado." The expression "Bobo" means imbecile, because it is very tame, and you can shoot it very easily. I have always seen them on the edges of the coffee-plantations.

54. Morococcyx erythropygus, Less.

One specimen, from Atenas, May. It was on the side of the road, where I observed it for several minutes before I killed it. It jumped from one stone to another, then came down and scratched the ground for insects, then perched on a low branch, and so on, without taking any notice of me, although I was only a few yards distant.

Subordo Heterodactylæ.

Family Trogonidæ.

55. Pharomacrus mocinno, Llave, var. *costaricensis*, Gould.

Native name "Quetzal."

A large number of specimens, from the Volcano of Irazu, Navarro, Candelaria, Naranjo, in fact from all the mountains around San José and Cartago. Very difficult to get. It is only by imitating the cry of the female that the men of the country can get a shot at the males. They keep in the denser parts of the forest, chiefly in the places called "barrancas" (deep ravines, very difficult of access). They feed on seeds and fruit. In May (the season of acorns) they are found in small flocks of ten to twelve on the robble trees, and can then be easily killed. During the breeding-season they go in pairs, male and female, constantly calling one another.

For further details on the habits of this bird, see part xi. of 'Ornithological Miscellany'[1].

56. Trogon massena, Gould.

San Carlos, February. I have always seen these birds in the forests. They perch high, and remain a long time stationary.

57. Trogon puella, Gould.

Several specimens killed at Navarro and in the Candelaria Mountains in May.

Subordo Anisodactylæ.

Subfamily Alcedininæ.

58. Ceryle cabanisi, Tsch.

Native name "Martin pescador."

Common everywhere, January to May.

Family Momotidæ.

59. Momotus lessoni, Less.

Four specimens, from San José, January, March. It is vulgarly

[1] I have sent a full account of my observations on this species to Mr. G. D. Rowley, which he has published in his interesting work.

called "Bobo," because it is quite tame and easy to kill. I saw these birds chiefly in the coffee-plantations near the streams. Its cry has rather a hollow sound, sometimes like the word "mou mot," or "mot mot," from which the name of the genus is derived.

60. UROSPATHA MARTII, Spix.

Several specimens from San Carlos, killed in February. Always seen in the forest, where they make a fearful noise calling one another. Its note has some resemblance to the cry of the former species, but is much stronger and more hollow. They are easily killed at first, but they are wilder after a few shots. I have met with them in small flocks.

61. PRIONIRHYNCHUS CARINATUS, Du Bus.

One specimen, a female, collected at San Carlos, February. Rare. Goes by pairs in the forest. This is the first time that this species has been found so far south.

62. EUMOMOTA SUPERCILIARIS, Sw.

One specimen, from Barranca, near Puntarenas, May. Like *Momotus lessoni* and other Momotidæ, it will remain for a long time perched on the same branch, and the only sign of its being alive is the frequent movement of its tail.

Ordo PICI.

Family PICIDÆ.

63. DYCTIOPICUS JARDINEI, Malh.

Native name "Carpintero."

Two specimens from the Volcano of Irazu and from Navarro, January and May 1877.

64. CENTURUS HOFFMANNI, Cab.

Two specimens, from San José, January, and Cartago, April; killed in the coffee-plantations. Also one specimen from Puntarenas which I cannot possibly separate from this species, although it is a much smaller bird.

65. CENTURUS PUCHERANI, Malh.

Two specimens, one from San Carlos, February, the other from Naranjo, April.

66. MELANERPES FORMICIVORUS, Sw.

Several specimens from the Volcano of Irazu, May 1877. I have seen some also at Naranjo.

Ordo Passeres.

Subordo Oscines.

Oscines dentirostres.

Family Turdidæ.

67. Turdus grayi, Bp.

Native name "Giguira."

Several specimens from San José, where they are found in large quantities during the fruit-season. They are particularly fond of a small fruit called in the country "cereza." My specimens differ widely from the ordinary form of *T. grayi* in their general coloration: instead of being rufous, they are ashy grey with a rufous reflection, but so different in coloration that it is impossible to mistake one for the other; the sides of the abdomen are of the same colour as the underside plumage, whereas in *T. grayi* they are rufous, nearly red.

I have two eggs of this bird, found in one nest built in the centre of an aloe growing on the road. They are green, with rufous spots.

68. Turdus plebeius, Cab.

One specimen, from Navarro, April.

69. Turdus nigrescens, Cab.

Several specimens from the Volcano of Irazu.

I never saw this species anywhere else. They are found in small flocks in the oak-tree region, at the altitude of from 6000 to 10000 feet. I found a nest containing two eggs. They are of a pale uniform green.

70. Turdus leucauchen.

Only one specimen, from Orozi, May.

71. Turdus obsoletus, Lawr.

Only one, female specimen, from Naranjo, April. This species seems to be rare. It lives in the forest.

72. Catharus melpomene, Cab.

Native name "Paxaro ingles" (English bird); I could not learn why.

Many specimens, from San José and Cartago, where they are found on the edges of the coffee-plantations. They are often seen on the ground searching for insects. They sing beautifully.

73. Catharus frantzii, Cab.

Two specimens from Navarro, May. Very rare.

74. Catharus gracilirostris, Salv.

Two specimens from the Volcano of Irazu, April. Very rare.

Family Sylviidæ.

75. Myiadestes melanops, Salv.

Several specimens, from Navarro, May 1877. Always found in the forest, where they are easily detected in consequence of their beautiful and clear song. It is short; but nothing could be more perfect in tone. Occasionally they are brought alive for sale to San José; but they are not easily domesticated.

Family Troglodytidæ.

76. Troglodytes intermedius, Cab.

Troglodytes hypaëdon, Sclat.

Many specimens, from San José, Cartago, and Naranjo. It is vulgarly called "Salta pared," which means "jump-the-wall." They are common in the gardens from January to May.

77. Thryophilus modestus, Cab.

Many specimens, from San José, Cartago, and San Mateo. I have always found them on the edges of the coffee-plantations. January to May.

78. Thryophilus castaneus, Lawr.

Several specimens, from San Carlos; killed in February. Found in the forests near the habitations.

79. Thryophilus pleurosticrus, Sclat.

Two specimens, from Puntarenas, May. Killed in the forest close to the sea.

80. Thryophilus thoracicus, Salv.

One single specimen, from San Carlos, February. Rare.

81. Campylorhynchus zonatus, Less.

Only one specimen, killed at San Mateo in May. They go in small flocks, making a great noise as they fly from one tree to another in the open spaces in the forest.

82. Henicorhina leucosticta, Cab.

Several specimens, from San Carlos and Orozi. Always found in the forest on the ground.

83. Henicorhina leucophrys, Tsch.

Only one specimen, from Navarro, May.

Family Mniotiltidæ.

84. Siurus noveboracensis, Gm.

One specimen, from San José, March.

85. Siurus aurocapillus, L.

Two specimens, from San José, January and March.

86. Mniotilta varia, L.

San Carlos, February.

87. Parula gutturalis, Cab.

Several specimens, from the Volcano of Irazu, April and May. Killed on the oak trees at an altitude of 6000 feet.

88. Helminthophaga peregrina, Wils.

Several specimens, from San José, January, March.

89. Dendrœca blackburniæ, Gm.

One specimen, from Naranjo, April.

90. Dendrœca pensylvanica, L.

San Carlos, February.

91. Dendrœca æstiva, Gm.

Several specimens, from San José, January, March.

92. Dendrœca vieilloti, Cassin.

One single specimen, from Puntarenas, killed in May on the mangrove trees, in close proximity to the river.

93. Geothlypis trichas, L.

Several specimens, from San José and Cartago, January to May.

94. Geothlypis poliocephala, Baird, var. *caninucha*, Ridgw.

Only two specimens, from San José, killed in January and February.

95. Myodioctes pusillus, Wils.

Several specimens, killed at San José in January.

96. Basileuterus mesochrysus, Sclat.

Many specimens, from San José and Cartago, January to May.

97. Basileuterus culicivorus, Licht.

San José, January to May.

98. Basileuterus uropygialis, Sclat.

Only one specimen, from San Carlos, killed in February. It is a very rare species, living along the streams in the forest. It never rests, but is constantly going up or down the river from one place to another, sitting on stones or scratching the ground. I saw several specimens in the same place, but could only get one, as it is a very wild bird.

99. Setophaga ruticilla, L.

Several specimens, from San José and Cartago, January and April.

100. SETOPHAGA AURANTIACA, Baird.

Several specimens from Cartago and Naranjo. This species inhabits the forests; in the middle of the day they go along the streams, flying from one tree to another, feeding on insects. I have always seen them going in pairs.

101. SETOPHAGA TORQUATA, Baird.

Several specimens of this rare species, all of them killed in the forest on the Volcano of Irazu. Always seen in pairs. The female differs very little from the male.

Family VIREONIDÆ.

102. VIREOSYLVIA FLAVOVIRIDIS, Cass.

One specimen, from San José, April.

103. VIREOSYLVIA OLIVACEA, Linn.

San José, January to May.

104. VIREOSYLVIA PHILADELPHICA, Cass.

Several specimens, from San José, January.

105. VIREOSYLVIA FLAVIFRONS, Vieill.

Several specimens, from San José, January, March.

106. VIREOSYLVIA JOSEPHÆ, Sclat.

Only one specimen, from Naranjo, April.

107. HYLOPHILUS DECURTATUS, Bp.

One specimen, from San José, May.

108. CYCLORHIS FLAVIPECTUS, Sclat.

Cyclorhis subflavescens, Cab.

Several specimens, from San José, February, March, and April.

Family AMPELIDÆ.

109. PTILOGONYS CAUDATUS, Cab.

Several specimens, killed in the forest of oak trees on the Volcano of Irazu; also some specimens from Navarro, May.

110. PHAINOPTILA MELANOXANTHA, Salv.

Several specimens of both sexes, from Navarro and Rancho Redondo, January to May. Found in pairs along the streams—not in the region of the oak trees, as suggested by Mr. G. Dawson Rowley, but much lower down, at an altitude of about 4000 feet, and in semitropical forests. The two sexes of this rare species have been beautifully figured, from specimens obtained by me, in the 'Ornithological Miscellany,' part x.

OSCINES TENUIROSTRES.

Family CŒREBIDÆ.

111. DIGLOSSA PLUMBEA, Cab.

Several specimens, from Cartago, Navarro, Naranjo, Volcano of Irazu, and La Laguna; all of them killed at the altitude of from 4000 to 8000 feet.

112. DACNIS VENUSTA, Lawr.

Several specimens, from Candelaria, May.

113. CHLOROPHANES SPIZA, var. *guatemalensis*, Sclat.

One specimen, from Naranjo, April.

OSCINES CONIROSTRES.

Family TANAGRIDÆ.

114. CHLOROPHONIA CALLOPHRYS, Cab.

Several specimens of this fine species, from Navarro and Candalaria, May.

115. EUPHONIA ELEGANTISSIMA, Bp.

Several specimens, from San José. Found on the road feeding on the fruit of the mistletoe. These birds sing beautifully, and are easily domesticated.

116. EUPHONIA CRASSIROSTRIS, Sclat.

Only one specimen, from Cartago, April.

117. EUPHONIA GOULDI, Sclat.

Two specimens, male and female, from San Carlos, February.

118. CALLISTE ICTEROCEPHALA, Bp.

Calliste frantzii, Cab.

Two specimens, from Naranjo and Orozi, June, May. Rather abundant on the edges of the forests where clearings have been opened.

119. CALLISTE GYROLOIDES, Lafr.

Navarro, May.

120. CALLISTE LARVATA, Du Bus.

Calliste franciscæ, Lafr.

Several specimens, from Naranjo, Orozi, and San Carlos.

121. CALLISTE DOWII, Salv.

Several specimens, from Navarro, May. Rare.

122. TANAGRA CANA, Sw.

Tanagra diaconus, Less.

Several specimens, from San José, January. Rather common on the trees bordering the coffee-plantations.

123. TANAGRA PALMARUM, Max.

Tanagra melanoptera, Hartl.

Common at Naranjo, April; San José, March to May.

124. RAMPHOCELUS PASSERINII, Bp.

San Carlos, February; Naranjo, April. Found commonly in the "rastrojos" (abandoned plantations near the habitations). Always seen in pairs; but several pairs are often met with near one another in the same locality.

125. PHLOGOTHRAUPIS SANGUINOLENTA, Less.

Orozi, May. I have seen them in pairs, like the above species; but sometimes five or six may be seen eating fruits or seeds on the same tree.

126. PYRANGA RUBRA, L.

San José, April.

127. PYRANGA ERYTHROMELÆNA, Licht.

Naranjo, April; Candelaria, May. In the forest.

128. PYRANGA BIDENTATA, Sw.

Several specimens, from the forests of Navarro and Volcano of Irazu, May.

129. PHŒNICOTHRAUPIS FUSCICAUDA, Cab.

Two specimens, male and female, from San Carlos, February. Found in the forest, perching on branches near the ground. Feeds on insects.

130. TACHYPHONUS LUCTUOSUS, Lafr. & D'Orb.

San Carlos, February. Feeding on insects in the forest.

131. TACHYPHONUS DELATTRII, Lafr.

San Mateo, May. I have always found these birds in company with the above species, and many others, where large quantities of migratory ants were travelling. They went in the same direction as the ants; and now and then I saw them hopping to the ground, and perching on low branches. Doubtless they were feeding on these ants.

132. CHLOROSPINGUS ALBITEMPORALIS, Lafr.

Several specimens collected at La Laguna, Naranjo, and Navarro, February, April, and May. This species seems to be widely distributed. I have seen them in the forest, chiefly at places where openings had been made for sowing-purposes.

133. BUARREMON CAPITALIS, Cab.

Pezopetes capitalis, Cab.

Several specimens from the Volcano of Irazu, April and May. The two sexes are exactly alike. They go in pairs; but several pairs

may be seen at a short distance from one another. They perch on the lower branches in the forest, but are most of their time busy scratching the ground in search of insects. They make such a noise in doing so, that at first I thought they were *Odontophori* or *Tinami*. The sexes are constantly calling each other; and as soon as you see one appearing, the other follows shortly after. They run fast. I have never seen this bird anywhere else.

134. Buarremon brunneinuchus, Lafr.

Several specimens from Cartago, Navarro, and Rancho Redondo, April, May. Rather a rare species in Costa Rica; all my specimens were obtained on the edges of abandoned plantations at the altitude of 4500 feet.

135. Buarremon chrysopogon, Bp.

Many specimens, from San José and Cartago.

136. Buarremon tibialis, Lawr.

Several specimens, from Navarro and the Volcano of Irazu, May. Rather scarce; found in the forest, principally along the streams.

137. Arremon aurantiirostris, Lafr.

Arremon rufidorsalis, Cass.

One specimen, from San Carlos, February.

138. Saltator magnoides, Lafr.

Several specimens, from San José and Cartago. Common in March and April.

139. Saltator grandis, Lafr.

Several specimens, from San José. Common in March, April, and May.

Family Fringillidæ.

140. Chrysomitris bryantii, Cass.

One male specimen, from the Volcano of Irazu, May. Rare.

Subfamily Passerellinæ.

141. Embernagra striaticeps, Lafr.

One specimen, from San Carlos, February. Killed close to the rancho. I have also seen this species at Puntarenas.

142. Pyrgisoma cabanisi, Sclat. & Salv.

Many specimens, from San José and Cartago, January to May. Killed on a sort of hawthorn edging the coffee-plantations.

143. Pyrgisoma leucote, Cab.

Melozone leucotis, Cab.

Several specimens, from San José, February, and Cartago, April. Very rare.

144. ZONOTRICHIA VULCANI, sp. n. (Plate IV.)

Supra cinereo-olivacea, pileo, dorso alis et cauda pallide nigris, plumarum marginibus olivascentibus, secundariorum dorso proximorum marginibus externis rufis; subtus plumbescenti-cinerea unicolor, rostro et pedibus pallide flavis.

Forehead olivaceous grey, with the central extremity of each feather nearly black; back and wing-coverts of the same colour, but the black is darker and very conspicuous in each feather; tail-coverts olivaceous; upper surface of the tail almost black, with olivaceous fringes; underside uniform plumbeous grey, slightly darker on the breast and sides of the abdomen; under tail-coverts olivaceous grey; underside of the wings and tail about the same grey as the abdomen, with silky reflections; primaries and tertiaries black, with olivaceous fringes; secondaries with the fringes wider and rufous in the upper part; the upper mandible of the beak nearly red, then black, with white tip; under mandible fleshy yellow; toes of the same colour. Full length $6\frac{7}{8}$ inches, wing $3\frac{1}{8}$, tail 3.

There is no difference whatever between the male and female, except that the latter is a trifle smaller.

The young is very much like young of *Junco*, *Peucea* or *Melospiza*; the upperside and underside are olivaceous grey, with the centre of each feather black; the fringes of the upper wing-coverts are wider than in the adult specimens and more rufous.

Several specimens, from the Volcano of Irazu, obtained at the altitude of 10,000 feet.

145. ZONOTRICHIA PILEATA, Bodd.

Many specimens, from San José, Cartago, Sarzero, and Volcano of Irazu. Vulgarly called "Come-maiz" (Eat-maize), because they are very injurious to the maize-plantation crops. It is met everywhere, even in the gardens, and takes the place in America of the *Passer domesticus* in Europe. I have seen them at nearly all altitudes. The eggs of this bird are green, with rufous spots all over at the broader end.

Subfamily CYANOSPIZINÆ.

146. VOLATINIA JACARINA, L.

San José, March.

147. CYANOSPIZA CIRIS, L.

One specimen from Tres Rios, January. Obtained in a curious way. Having shot what I thought to be *Cyanospiza cyanea*, I could not find my bird where I thought I saw it fall, but during my search I found this specimen of *Cyanospiza ciris*, quite dead. It was so thin that it had evidently died from cold and hunger; and I attribute to this fact the body not being decomposed, as I have no doubt that it had been dead for some time. I took great care in skinning the bird; and I had the satisfaction to make a fine skin of it, which is now exhibited.

148. Cyanospiza cyanea, L.

San José, March.

149. Phonipara pusilla, Sw.

Several specimens, from San José, January and February. Found in the rastrojos.

Subfamily Spermophilinæ.

150. Hedymeles ludoviciana, L.

One specimen, from San José, January.

151. Pheucticus tibialis, Baird.

Several specimens, from Navarro and the Volcano of Irazu, May.

152. Spermophila moreleti, Pucher.

Several specimens, from San José, March and April. Very common in the maize-plantations in the time of the harvest.

153. Spermophila corvina, Sclat.

Two specimens, male and female, from San Carlos, February.

154. Spermophila aurita, Bp.

Spermophila semicollaris, Lawr.

One specimen, male, from San Mateo.

Subfamily Emberizinæ.

155. Euspiza americana, Gm.

Several specimens, from San José and Potrero cerrado (Volcano of Irazu). Excessively common in March, flying about on the roads in large flocks. It is then very fat, and delicious eating.

Oscines cultrirostres.

Family Icteridæ.

156. Ocyalus wagleri, Gray and Mitch.

Orozi, May. I have also seen many specimens at San Carlos and Naranjo.

157. Ostinops montezumæ, Less.

Very common at San Carlos and Naranjo, February. The sight of their nests hanging close together at the extremity of the branches on the trees is very peculiar. They select the highest trees left where the forest has been cleared; so that they cannot escape detection. I have seen as many as thirty nests in one single tree. They make a fearful noise when they come and go out of their nests.

158. Cassicus prevosti, Less.

One specimen, from San José, March. Killed on the bushes forming the edges of coffee-plantations. I have seen many other specimens.

159. Icterus baltimore, L.

Several specimens, from San José, March and April. Called vulgarly "Cacique de Naranjo" (Cacicus of orange-trees); because they are very fond of this fruit.

160. Icterus prosthemelas, Strickl.

One specimen, from Naranjo, April.

161. Molothrus æneus, Wagl.

Very common at San José, February to May. They go about in large flocks, and are often seen in the gardens of the town, as well as on the pavement in the streets.

162. Sturnella ludoviciana, L.

Very common in the "potreros" (plains), principally at Cartago, April and May.

Family Corvidæ.

163. Psilorhinus morio, Licht.

Several specimens, from San José. Very common in the coffee-plantations. Called vulgarly "Pepe;" because their cry is an imitation of that Spanish word, in English "papa." As soon as they perceive any body, man or beast, moving about they fly, making a fearful noise with their cries of pa, pa, pa. You can depend upon it that when you hear these birds crying some one is near at hand.

Subordo Tracheophonæ.

Family Dendrocolaptidæ.

164. Synallaxis erythrops, Sclat.

Two specimens, from the Volcano of Irazu, March, and Navarro, May. In the forest.

165. Synallaxis pudica, Sclat.

Synallaxis nigrifumosa, Lawr.

One specimen, from Naranjo, April; killed on the edge of the sugar plantations.

166. Pseudocolaptes boissoneauti, Lafr. (?).

One specimen from Navarro, May. It differs from the other specimens which I have of *P. boissoneauti* in the sides of the throat being yellow instead of pure white; however, for the present, I do not consider this difference sufficient to make another species of it.

Subfamily Philydorinæ.

167. Philydor rufo-brunneus, Lawr.

One specimen, from Navarro, May.

168. Anabazenops variegaticeps, Sclat.

Several specimens, from Candelaria, April, May.

Subfamily Dendrocolaptinæ.

169. Margarornis rubiginosa, Lawr.

Two specimens, from Navarro, May.

170. Glyphorhynchus cuneatus, Licht.

One specimen, from Naranjo, April. Killed in the forest on the trunk of a tree. This bird is constantly flying from one tree to another. It is one of those which travel in company with many other species.

171. Dendrocolaptes sancti-thomæ, Lafr.

One specimen, from Navarro, April.

172. Dendrocolaptes punctico1lis, Sclat. and Salv.

Two specimens, ♂ and ♀, from Naranjo, April. I killed the two on the same tree. They were busily engaged in building their nest in a hole of the trunk.

173. Dendrornis susurrans, Jard.

One specimen, from San Carlos, February.

174. Picolaptes compressus, Cab.

Two specimens, from Navarro, May.

175. Xiphorhynchus pusillus, Sclat.

One specimen, from Naranjo, April. This species seems to be rare. My specimen was killed on the trunk of a tree when going up and down on the same.

Family Formicariidæ.

Subfamily Thamnophilinæ.

176. Thamnophilus nigricristatus, Lawr.

Thamnophilus punctatus, Cab.

One specimen, from San Carlos, February. Rare. All the species of this genus go about in the forest in company with many other birds.

177. Thamnophilus nævius, Gm.

Two specimens, from San Carlos, February.

178. Thamnophilus doliatus, L.

One specimen, from San Mateo, May.

179. Dysithamnus striaticeps, Lawr.

One specimen, from San Carlos, February. A very rare species.

180. Dysithamnus semicinereus, Sclat.

Several specimens, Naranjo, April.

Subfamily FORMICIVORINÆ.

181. MYRMOTHERULA MELÆNA, Sclat.

Only one specimen of this fine species. It seems to be very rare. I killed it in the forest perched near the ground. It formed part of a large flock of birds which was not a single moment at rest. As I said before, it is a very common occurrence to see large quantities of ants where these birds are. I have always observed that the Tanagridæ (genus *Buarremon*), Turdidæ (several genera) and Dendrocolaptidæ (all the genera) and a few others keep to the ground, feeding on ants and other insects. At the same time birds of other genera, as *Tanagra*, *Calliste*, *Pipra*, and of many genera of Tyrannidæ, Cœrebidæ, and Ampelidæ, are perched on the trees above, some of them feeding on fruit, others on insects. All of them are constantly flying about all the time.

But the most interesting fact is that every species follows the same route. They travel rather fast; and it has always been an object of admiration to me to see how far they could travel in one day, taking their food at the same time.

I was in the habit of searching for one of these flocks. Once found, it was only a matter for me of selecting what species I wanted; but you must follow the same route as they, and occasionally you may lose yourself in the forest. These remarks apply to species found in the tropical forests from the level of the sea to the altitude of 4000 feet. But I have also observed the same thing with the species which inhabit higher altitudes, whether they live in the forests or on the plains.

182. MYRMOTHERULA MENETRIESI, d'Orb.

One specimen, from Naranjo, April.

183. FORMICIVORA BOUCARDI, Sclat.

San Carlos, February.
Rather rare.

184. RAMPHOCŒNUS SEMITORQUATUS, Lawr.

One specimen, from San Carlos, February. Very rare. Perch on small trees in the forest. It was with the flock spoken of above.

185. CERCOMACRA TYRANNINA, Sclat.

San Carlos, February.

186. MYRMECIZA IMMACULATA, Sclat. and Salv.

Several specimens, from San Carlos, February, and San Mateo, May. Rare.

This species is found on both sides of the country—I mean, in the tropical forests of the Atlantic and Pacific plains. It is therefore very probable that tropical species travel from one sea to the other where they have the facility to do so, without the necessity of passing to a higher altitude; and this is the case in Costa Rica. In a certain part of the country you can pass from one sea to the other without leaving the tropical forests.

Subfamily Formicariinæ.

187. Pithys bicolor, Lawr.

One specimen, from San Carlos, February.

188. Formicarius hoffmanni, Cab.

One specimen, from San Carlos, February, killed in the forest, on the ground. This bird is constantly going about, and has a peculiar way of raising and lowering its tail when running along, with which I was very much amused. I saw several other specimens always on the ground. The same thing occurs with the birds of the genus *Siurus*.

189. Grallaria perspicillata, Lawr.

One specimen, from San Carlos, February. Very rare.

Family Tyrannidæ.

190. Sayornis aquatica, Sclat. & Salv.

Several specimens, from San José, January, March. This bird has the curious habit of staying all day long on the stones or bushes growing in or near the streams. It will always be seen at the same place for hours and days one after another. It lives on all the insects flying about over the stream. They are always seen in pairs, ♂ and ♀. Another pair may occasionally be seen at a short distance.

Subfamily Platyrhynchinæ.

191. Platyrhynchus albigularis, Sclat.

One specimen, from Navarro, May.

192. Todirostrum cinereum, L.

Several specimens, from Cartago and San José. Rather rare.

193. Euscarthmus squamicristatus, Lafr.

Two specimens, from Naranjo, April. A rare species and difficult to detect. Goes about in the forest on the small trees.

194. Serpophaga cinerea, Strickl.

From Naranjo, April. Excessively rare and remarkable for its habits. It has exactly the same mode of life as *Sayornis aquatica*, living along the streams and sitting on the stones lying in or near the water.

First I killed the ♀, in the morning, and for hours could not get a shot at the ♂, and went away. In the afternoon I went again to the same place, and after a little while managed to kill the ♂ bird. The two sexes are exactly alike.

My specimens differing from the Columbian bird, which I have under the name of *S. cinerea*, I give a description of them:—

Forehead and cheeks quite black, with the inner webs of the central feathers white, back and upper coverts of the tail ashy grey;

throat, breast, and abdomen of the same colour, but much paler, nearly white on the throat; primaries and secondaries black, tertiaries black with white ends or fringes; upperside of the tail black, underside dark grey, nearly black; under wing-coverts of the same colour as the abdomen; bill and toes black.

Length 4 inches, wings $2\frac{1}{8}$, tail $1\frac{5}{8}$. The two sexes are exactly alike. Closely allied to *S. cinerea*, but a much smaller bird altogether; besides, the colour of the back has not the olive tint conspicuous in *S. cinerea*.

Subfamily ELAINEINÆ.

195. MIONECTES OLEAGINUS, Cab.

One specimen, from San Mateo, May.

196. TYRANNISCUS PARVUS, Lawr.

One specimen, from Navarro, May.

197. ELAINEA PAGANA, Licht.

Elainea subpagana, Sclat. & Salv.

Several specimens, from San José, January to May. On the edges of the coffee-plantations.

198. ELAINEA FRANTZII, Lawr.

One specimen, from the Volcano of Irazu, March.

199. LEGATUS ALBICOLLIS, Vieill.

Several specimens, from Naranjo, April, all of them killed on a large tree standing by itself in a "potrero" near the habitations.

200. MYIOZETETES TEXENSIS, Giraud.

Two specimens, from San José, March, and Naranjo, April. Common.

201. RHYNCHOCYCLUS SULPHURESCENS, Spix.

Only one specimen, from San Carlos, February.

202. MYIODYNASTES LUTEIVENTRIS, Sclat.

Two specimens, from Orozi, May.

Subfamily TYRANNINÆ.

203. MEGARHYNCHUS PITANGUA, L.

Native name "Chorchita."

One specimen, from San José, March. Not common here.

204. MUSCIVORA MEXICANA, Sclat.

Native name "Rey de los Traga moscas."

Two specimens, male and female, from San Ramon. Lives in the forest only. When in love it shows its beautiful crest with much effect.

205. MYIOBIUS SULPHUREIPYGIUS, Sclat.

Two specimens, from Naranjo, April.

206. MYIOBIUS ERYTHRURUS, Cab.

One specimen, from San Carlos, February.

This seems to be a rare species. I wanted more specimens, and could only succeed in seeing another, which I could not shoot.

207. MITREPHORUS AURANTIIVENTRIS, Lawr.

Several specimens, from La Laguna, February Naranjo, April, and Candelaria, May. I killed these in the forest at the altitude of 4000 to 8000 feet. They used to stay at the same place for a long time; they select a branch, and you see them there all day long. All the time they fly about catching insects, and returning to the same spot. I missed one of my specimens twice; notwithstanding, it came back to its favourite branch. There is no appreciable difference between the two sexes. I have also one specimen with the abdomen of the same colour as the throat and the breast; otherwise there is no appreciable difference. It was obtained at San Mateo, altitude 1000 feet.

208. EMPIDONAX FLAVESCENS, Lawr.

Several specimens, from Naranjo, April.

209. CONTOPUS VIRENS, L.

Several specimens, from Cartago, April.

210. MYIARCHUS CRINITUS, L.

Native name "Traga mosca."

Several specimens, from San José, January, and Cartago, April. Rather rare in Costa Rica. They used to perch on a selected branch of the trees edging the coffee-plantations, and remained there all day long catching the insects passing by.

211. MYIARCHUS PANAMENSIS, Lawr.

Three specimens, from Punta Arenas, May. Killed on the mangle-trees near the river.

212. MYIARCHUS LAWRENCEI, Giraud.

Myiarchus nigricapillus, Cab.

Many specimens, from San José, Cartago, and Naranjo, January to May.

Native name "Tonto vivo."

213. MYIARCHUS CINERASCENS, Lawr.

Two specimens, from Punta Arenas, May. Killed at the end of the sandy point near the town.

214. TYRANNUS MELANCHOLICUS, Vieill.

Many specimens, from San José, January to May. Common everywhere, especially on the trees surrounding the coffee-plantations.

215. Milvulus forficatus, Gm.

Native name "Tijerillo."

Several specimens from San José, January to May. Very common in the Savana, a beautiful plain about one mile and a half from the town. They are usually perched on the small shrubs in the plain.

Family Cotingidæ.

216. Tityra personata, Jard. & Selby.

Several specimens from Orozi. Always seen perched on the highest trees, where they remain sometimes for hours, as if they were on the watch. They are easily mistaken for *Carpodectes nitidus*, which they resemble very much when seen at a long distance.

217. Pachyrhamphus versicolor, Hartl.

Only one specimen, from Candelaria, May. Very rare.

218. Pachyrhamphus cinereiventris, Sclat.

One specimen, from San Mateo, May.

219. Lipaugus holerythrus, Sclat. & Salv.

Several specimens from San Carlos, February; and Naranjo, April.

220. Carpodectes nitidus, Salv.

One adult female, from San Carlos, February. This sex, being quite new to science, I give a description of it.

Head and back of a dark bluish grey, rather lighter on the forehead; the upper feathers of the tail nearly black, the underside ashy grey; wing-coverts of the same colour as the back; primaries black; the secondaries and tertiaries have a white border on their inner webs; cheeks, throat, and round the eyes white; breast and abdomen pale bluish grey; under wing- and under tail-coverts white; the lower part of the abdomen white; thighs white; toes black; bill blue.

Total length $8\frac{2}{8}$ inches, wing $5\frac{2}{8}$, tail $2\frac{6}{8}$.

I procured this bird quite accidentally. During our stay at San Carlos we used to bathe every afternoon in a stream close by the rancho, and I always carried my gun with me. The third day after our arrival at San Carlos we were quietly enjoying our bath when my friend Meil saw this bird alighting on a tree close by. Immediately he told me I came out of the water and took my gun; but the bird was perched so high that I could not make out with certainty what species it was. I was struck by its colour, and I thought immediately of *Carpodectes*, of which I had seen a figure in the 'Proceedings.' I had a shot at the bird; and it fell down, but far away in the forest amongst Agave plants growing near the stream. My friends saw the direction where it fell; and although I was quite naked, I went into the forest, and, after twenty minutes of the most active search, I had the pleasure of finding it quite dead. Several times I was near giving up the search; but now I feel very happy

that I did not do so, as I consider this bird one of the most valuable additions to my collection.

Every day after that I went to the same place and in the neighbourhood to look for more; but I was disappointed, until the day before my departure, when I saw what I think was the mate of my female; but, to my great annoyance, I could not get a shot at it. It sat for more than two hours, without moving, at the top of a tree more than one hundred feet high, where I could not kill it. It kept me until nightfall with my head lifted up in such a manner that I had a stiff neck when I left. I think it is the greatest punishment for a naturalist to be looking at a very rare bird above his head for several hours without being able to get a shot at it.

When I went away I recommended the people living in the rancho to kill some specimens for me. I offered them a high price; but all for nothing: they said they never saw another. If it was not neglect of theirs, this must be a very rare bird indeed.

221. Chasmorhynchus tricarunculatus, Verr.

One specimen from the Volcano of Irazu, January. This seems to be a rare species. My specimen was killed at the altitude of 6000 feet.

222. Cephalopterus glabricollis, Gould.

San Carlos, February; Volcano of Irazu, May. This singular bird is found at all altitudes up to 10,000 feet in the forests. Were it not for its cries it would be excessively difficult to detect, as it always keeps in the densest parts. Its cry is something extraordinary. When I heard it first I thought it was a new species of *Crax* or some other similar large bird. Being very anxious to see what it was, I went into the forest; and after a great deal of trouble I found it. They perch rather high, but are easily killed when once found.

Family Pipridæ.

223. Pipra mentalis, Sclat.

One specimen from San Carlos, February. Perches usually low, and keeps in the forest.

224. Pipra leucorrhoa, Sclat.

Cervantes, Naranjo.

225. Chiroxiphia linearis, Bp.

Several specimens, from Navarro, May.

226. Chiromachæris candæi, Parz.

One specimen, from San Carlos, February. Perches on the small trees in the forest; and the male has the particular habit, as have some other species of Pipridæ, of making a great sound when flying from one branch to another. It imitates exactly the sound produced by the children's toy rattle. I think this noise is produced by its

beak. It resembles the sound of mandibles opening and shutting with noise several times in succession.

Ordo Macrochires.

Family Caprimulgidæ.

227. Nyctidromus albicollis, Gm.

Two specimens, male and female, from Cartago. They were in a small forest, on the ground. They usually fly away as you get quite close to them, and settle again a little further on.

Family Hirundinidæ.

228. Atticora cyanoleuca, Vieill., var. montana, Baird.

Several specimens from San José, March; Cartago, April. During these months they are building their nests in the roofs of the houses. They appear in February, and leave when the rainy season comes.

229. Stelgidopteryx fulvipennis, Sclat.

Stelgidopteryx fulvigula, Baird.

Several specimens, from San José, March to May. They are principally seen flying near the streams, sometimes in large quantities. The first time I had a shot at them I killed six; there were about fifty on a small tree. Although I have killed a good many, I never found a female amongst them. I suppose the females must have been in their nests somewhere; but where, I was never able to find out.

Family Cypselidæ.

230. Hemiprocne zonaris, Shaw (?).

In one of my excursions, at the Volcano of Irazu I saw a large quantity of birds which, I think, must have been this species. I am certain about the genus; but not having been able to get a specimen, I leave the question of species for the future.

Ordo Trochili.

231. Phaëthornis longirostris, Delattre.

Naranjo, April. This bird is always seen in the denser part of the forest. One of the favourite flowers on which it feeds is that of the plane-tree.

232. Phaëthornis emiliæ, Bourc.

Several specimens from Tres Rios, January; Naranjo, April.

233. Pygmornis adolphi, Gould.

San Carlos, February. This is a very common species—but very difficult to detect, as it only comes out of the forest early in the morning and late in the afternoon. In the middle of the day they are very abundant in certain parts of the forest, many specimens being seen at a few yards from one another. They are perched on small dry

branches near the ground. In the pairing-season they sing all day long; the note sounds like "*bebe, bebe,*" repeated a great many times in succession. Although it cannot be heard at a long distance, it is perfectly amazing and amusing to hear them. As soon as one finishes, another commences; and it is a puzzle to find where they are, although they may be only at two or three yards distance, on account of their colour and their diminutive size. When singing they move their head and tail in the most pretty way. Now and then they fly about, but soon return to their favourite branch. I have usually heard the song of these birds in the breeding-season, the males singing while the females are on their nests.

When in Mexico I have heard many species of Humming-birds sing, and I could distinguish by its song what species it was. Their songs are very pretty, and quite distinct from one another, especially when they are of birds of distinct genera. I have heard *Pygmornis adolphi, Campylopterus hemileucurus, Sphenoproctus curvipennis, Eugenes fulgens, Cœligena clemenciæ, Lamprolæma rhami, Delattria henrici, Petasophora thalassina,* and several other species sing.

234. CAMPYLOPTERUS HEMILEUCURUS, Licht.

Several specimens from Tres Rios, January; and Rancho redondo, May. Rather rare in Costa Rica. Inhabits the forests; but takes its food as well on the flowers of trees growing close by in the open spaces. My specimens were obtained when sucking the flowers of an acacia tree which is found abundantly in the coffee-plantations. It has a special sharp cry when flying about. It commonly constructs its nest in the barrancas, on the plants growing between the rocks, and generally uses moss for its construction.

235. EUGENES SPECTABILIS, Lawr.

One male and one female of this very rare species, from the Volcano of Irazu, April and May. Altitude from 6000 to 8000 feet. It is very fond of a parasitic plant something like mistletoe, which bears a beautiful red flower. No description having been published of the male of this species, I give it now.

Forehead dark metallic blue; back black; rump metallic green; tail bronzy black, with the two central feathers more greenish; wings black, with the upper coverts metallic green; throat metallic dark green; breast and abdomen greyish, mixed with green feathers; feet and beak black.

Length $5\frac{5}{8}$ inches, wing $3\frac{2}{8}$, tail $1\frac{6}{8}$, beak $1\frac{1}{8}$. (*Mus.* Boucard.)

The chief distinctions between this species and *Eugenes fulgens* are in its much larger size, its longer beak, its grey breast and abdomen, its back entirely black, and the colour of the crown and throat, which are quite of a different green and blue.

236. OREOPYRA CINEREICAUDA, Lawr.

One specimen of this rare species, from Navarro, May. Inhabits the forest.

237. Oreopyra calolæma, Salv.

Many specimens of both sexes from Naranjo, April; Navarro and Rancho redondo, May. I have not the least doubt that the bird described as *Anthocephala castaneiventris*, Gould, is the female of this species. These birds are only met with in the forest.

238. Oreopyra hemileuca, Salv.

Two specimens, from Naranjo, April. It seems to be a very rare species.

239. Petasophora cyanotis, Bourc.

Petasophora cabanisi, Lawr.

Several specimens from the Volcano of Irazu, April. Rather common at the altitude of 8000 feet, feeding on the flowers of a small shrub. They take possession of a certain space containing several of these shrubs; and when not feeding on these flowers, they perch on a dry branch near the place, and fight all the other Humming-birds that dare to intrude.

240. Heliodoxa jacula, Gould.

Heliodoxa henryi, Lawr.

Several specimens from Naranjo, April; Volcano of Irazu, May. One male, although it is not in very fine plumage, has a bright front, and the throat exactly like the specimens from Columbia. Rather rare in Costa Rica.

241. Heliomaster constanti, Delattre.

Only one young male, from San José, January; killed while he was sucking the flower of an acacia tree.

242. Thalurania colombica, Bourc. & Muls., var. venusta, Gould.

Several specimens from San Carlos, February; and Naranjo, April. It perches on very high trees in the forests, and is difficult to get at. It is a rare species in Costa Rica.

I spent many hours before I could get the pair which I have, from San Carlos. I could not recognize the bird, because it was standing and feeding on the flowers of a parasitic plant very high on a large cedar tree. I thought it was a new species of *Microchera*, so small was its appearance. When I killed the first I was quite disappointed, and was sorry to have lost so much time for it.

243. Klais guimeti, Bourc. & Muls.

Klais merriti, Lawr.

Only two specimens, from Navarro, May: a very rare species.

244. Microchera parvirostris, Lawr.

Only one specimen of a young male, given to me by Mr. Juan Zeledon. Excessively rare. Although I knew the exact locality where found, I could never find one.

245. Paphiosa helenæ, Del.

I saw several male specimens of this species at San Carlos; but I was never able to get a shot at them. I have one female specimen from Turrialba.

246. Dorycha bryantæ, Lawr.

San José, March; Volcano of Irazu, April. A very rare species. It appears as soon as it is daylight, and is very quick. It never rests long in one place. When on the wing it makes a great noise, similar to that of a large Coleopteron (Scarabeidæ) when flying.

247. Trochilus colubris, Linn.

One specimen, from San José, January. Seems to be very rare in Costa Rica.

248. Selasphorus scintilla, Gould.

Several specimens from Cartago, April; and Volcano of Irazu, May. Seen also at the high altitude of 10,000 feet in company with *Selasphorus flammula*. Feeds on the flowers of small plants. When I say feeds on the flowers, I mean that it takes from the flowers not only the honey, but, above all, the minute insects which are inside. This is usual with all the Humming-birds. I have no doubt that they can live a certain time on honey only; but it is not sufficient, and their principal food is insects. It is very seldom that you skin a Humming-bird without finding the crop filled partially with insects of all descriptions. I have brought home a certain number of crops in alcohol. All of them contain insects, which I intend to determine as soon as possible. *S. scintilla* makes a very slight noise when flying; it is not more than that of a drone-bee.

The place where I killed my specimens had been taken possession of by a certain number of *Sancerottia sophiæ* and *Pyrrhophæna riefferi*. Each one of these had its assigned place, and used to drive away any trespasser. I noticed that *S. scintilla* used to go only to the small plants near the ground; and I have no doubt that the little noise made by the bird was to escape its enemies *S. sophiæ* and *P. riefferi*. Flying very low was another precaution; however, the sight and the hearing of these little birds is so subtle that poor *S. scintilla* was soon detected and obliged to fly away. I think this also is the reason why this species was rather scarce.

249. Selasphorus flammula, Salv.

Several specimens, male and female, of this very rare species. All of them were killed at the summit of the Volcano of Irazu, on parasitic plants (mistletoe) growing on small alpine trees in a soil composed principally of ashes and scoriæ. There, at the altitude of 10,000 feet and more, it takes possession of a locality where flowers are abundant, and defends its property against *S. scintilla* and other birds.

250. Thaumatias cupreiceps, Lawr.

One specimen, from Naranjo, April, killed in the forest. I have also several other specimens of this species sufficiently good for skeletons.

251. Eupherusa egregia, Sclat. & Salv.

One specimen, from Navarro, May.

252. Amazilia cinnamomea, Less.

Several specimens, from San Mateo and Puntarenas, May. This species seems to be found only on the Pacific coast. I have some specimens from Tehuantepec; and I remember having seen this species near Juquila (Mexico). The male and female are exactly alike. They are foud of the flowers of orange-trees.

253. Pyrrhophæna riefferi, Bourc.

Several specimens, from San José and Cartago, January to May. Very common species, and quite domestic in its habits. Quantities of them may be seen in private gardens.

254. Saucerottia sophiæ, Bourc.

Several specimens, from San José and Cartago, January to May. They are constantly fighting with *P. riefferi*; but this species is seldom seen in the gardens of San José.

255. Panterpe insignis, Cab. & Heine.

Several specimens of this fine species, from the Volcano of Irazu, April and May. I never saw this bird anywhere else. It is very rare. It feeds on the mistletoe growing on the robble (oak tree).

The female is a little smaller than the male; but otherwise they are exactly alike. This is one of the few species in which the female is a bright-coloured bird, nearly as fine as the male. I have several females, and I am quite sure about the sex.

256. Damophila amabilis, Gould.

Several specimens, from San Carlos, February. A very rare species; found only in the forest.

257. Sapphironia boucardi.

Arinia boucardi, Muls., Ann. Soc. Linn. de Lyon, 12 Oct. 1877.

Several specimens, from Puntarenas, May. Male and female. Mus. Boucard.

258. Chlorolampis caniveti, Less.

Chlorolampis salvini, Cab.

Several specimens, from San José and Cartago, January to May. Commonly found in the gardens, where it makes its nest.

3. Descriptions of seven new Species of Land-Shells recently collected in Costa Rica by Mr. Adolphe Boucard. By George French Angas, C.M.Z.S., F.L.S., &c.

[Received November 17, 1877.]

(Plate V.)

Helix boucardi, n. s. (Plate V. figs. 5, 6, 7.)

Shell narrowly and profoundly umbilicated, depressedly conical, moderately thin, very finely radiately striated, white, the upper surface ornamented with two fawn-coloured bands passing into chocolate towards the apical whorls, or entirely fawn-colour, with a narrow effuse chocolate band next to the periphery; whorls $4\frac{1}{2}$, somewhat convex, strongly bluntly keeled at the periphery, with an impressed groove below the keel; apex obtuse, tinged with violet; sutures impressed, bordered with a narrow chesnut line; base convex, white; umbilicus dark brown; umbilical region tinged with lemon-yellow; aperture very oblique, narrowly quadrately ovate, pale violet within; outer lip a little expanded and reflexed, slightly sinuate and projected above, arcuate below.

Diam. maj. 13 lines, min. 10, alt. 7.

Hab. Navarro, Costa Rica; on leaves of trees. (*Mus.* Boucard.)

Helix adela, n. s. (Plate V. figs. 8, 9, 10.)

Shell umbilicated, discoidal, flattened, very finely radiately striated, pale straw-colour, ornamented with a single narrow black band just above the periphery of the last whorl; whorls $3\frac{1}{2}$, somewhat convex; spire very much depressed; base flatly convex, with an excavated area around the umbilicus which is shallow and non-perspective; aperture horizontal, narrowly oblongly ovate; outer lip slightly expanded and reflexed.

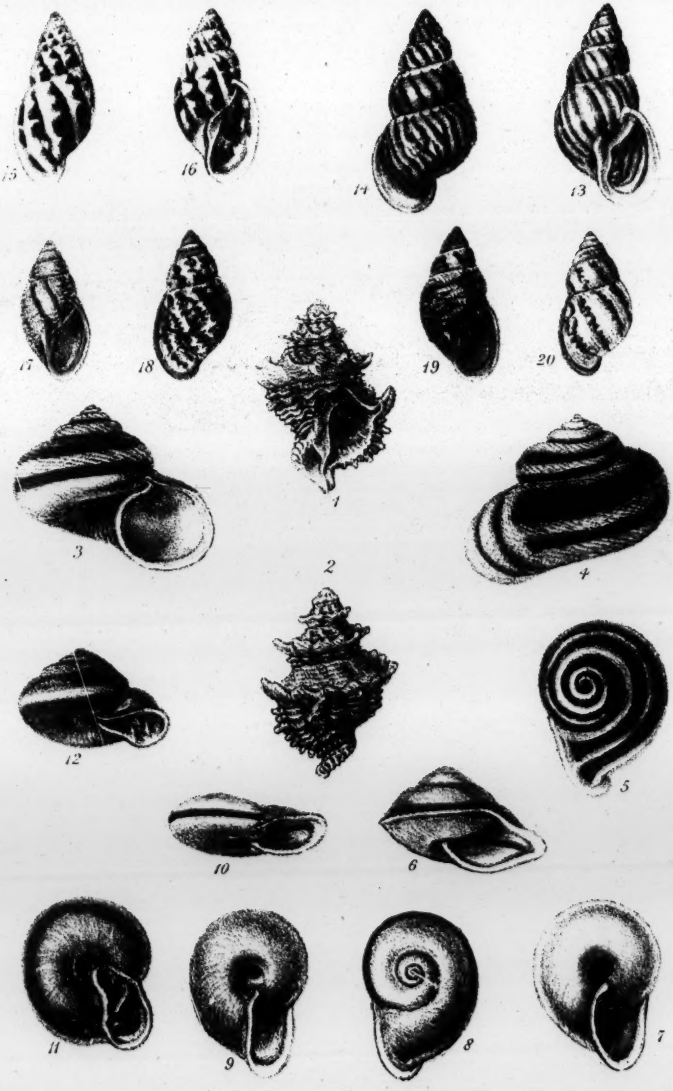
Diam. maj. 12 lines, min. 9, alt. 4.

Hab. Novarro, Costa Rica, on trees. (*Mus.* Boucard.)

Helix æsopus, n. s. (Plate V. figs. 11, 12.)

Shell umbilicated, depressedly conoidal, moderately solid, very finely obliquely striated and finely granulated, the granules being denser on the last whorl and obsolete towards the apex, brown, with a pale suffused band at the periphery of the last whorl; whorls 5, somewhat convex, the last bluntly keeled, contracted and deflected behind the outer lip; apex obtuse; base rather flattened; aperture horizontal, ear-shaped, brown, with a prominent, erect, slightly undulating, lamelliform, transverse ridge within upon the wall of the body-whorl; peristome white, somewhat thickened and reflexed, with a short blunt tooth at the base of the columella and a longer compressed triangular one incurved within the aperture opposite the ridge on the body-whorl; margins united by an erect lamella.

Diam. maj. 12 lines, min. 10, alt. 6.



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NEW SHELLS FROM COSTA RICA, &c.

Hab. Buena Vista, Costa Rica, at an altitude of 3000 feet.
(*Mus.* Boucard.)

This shell belongs to a group of *Helices* remarkable for their curiously toothed apertures, having as its nearest allies *H. quadridentata*, Brod., and *H. auriculina*, Petit.

CYCLOTUS BOUCARDI, n. s. (Plate V. figs. 3, 4.)

Shell widely and perspectively umbilicated, globosely turbinate, white, with a broad olive-chestnut band above and a narrower one just below the periphery, very finely longitudinally striated and crossed with rows of rugged irregular undulating oblique malleated ridges; whorls 6, convex, rapidly increasing, the last large and rounded; aperture nearly circular, white within; peritreme simple, scarcely thickened, with a semilunar notch at the junction of the body-whorl.

Diam. maj. 16 lines, min. 13, alt. 12.

Hab. San Carlos, Costa Rica.

A fine species with an excavated notch where the peritreme touches the body-whorl, as in *Cyclotus mexicanus*, Menke, from Vera Cruz.
(*Mus.* Boucard.)

BULIMUS JOSEPHUS, n. s. (Plate V. figs. 13, 14.)

Shell perforate, elongately ovate, moderately solid, very finely obliquely striated, whitish, ornamented with somewhat distant irregular slightly undulating narrow olive-brown stripes, which become obsolete near the umbilical region; spire elevately conical; sutures impressed; apex brownish yellow; whorls $6\frac{1}{2}$, flatly convex; aperture ovate; somewhat effuse below; outer lip expanded and flattened; columella triangular and flattened inwards, ending in a blunt rounded callus internally.

Diam. 7 lines, alt. 16.

Hab. San José, Costa Rica, on the trunks of acacia trees.
(*Mus.* Boucard.)

BULIMUS IRAZUENSIS, n. s. (Plate V. figs. 17–20.)

Shell somewhat elongately ovate, rimate, moderately thin, longitudinally irregularly striated, shining, more or less longitudinally striped or freckled with black, and ornamented with numerous small white spots; whorls 6, rather convex; spire a little shorter than the aperture; aperture oblong-ovate; lip thin, simple, tinged inside with rose-colour.

Diam. 6 lines, alt. 12.

Hab. Volcano of Irazu, Costa Rica, on low aromatic bushes on the eastern slope of the volcano.

A variety of this pretty species occurs in which the prevailing colour is light brown, profusely sprinkled with little white spots.
(*Mus.* Boucard.)

BULIMUS NAVARRENSIS, n. s. (Plate V. figs. 15, 16.)

Shell narrowly rimate, more or less elongately ovate, thin, irre-

gularly longitudinally striated, shining, whitish, tinged with pale straw-colour towards the base, variously painted with irregular more or less undulating longitudinal greyish black stripes or quadrilateral blotches, frequently taking the form of a confused band towards the centre of the whorl; spire conical, shorter than the aperture; apex acute; whorls $5\frac{1}{2}$, rather convex, the last somewhat inflated; aperture elongately ovate; peristome simple, thin; outer lip slightly expanded outwards.

Diam. 6 lines, alt. 12.

Hab. Navarro, Costa Rica; a somewhat smaller and more inflated variety was obtained by Mr. Boucard at Cartago.

This species somewhat resembles *B. iodostylus* of Pfeiffer; but it is generally more inflated, with the outer lip expanded, and wants the violet colouring on the columella characteristic of the latter.

Abundant on acacia trees. (*Mus.* Boucard.)

EXPLANATION OF PLATE V.

Figs. 1, 2. *Latiaxis elegans*, p. 74.
3, 4. *Cyclotus boucardi*, p. 73.
5–7. *Helix boucardi*, p. 72.
8–10. —— *adela*, p. 72.
Figs. 11, 12. *Helix æsopus*, p. 72.
13, 14. *Bulimus josephus*, p. 73.
15, 16. —— *navarrensis*, p. 73.
17–20. —— *irazuensis*, p. 73.

4. Description of a new Species of *Latiaxis*. By George French Angas, C.M.Z.S., F.L.S., &c.

[Received November 17, 1877.]

(Plate V.)

Latiaxis elegans, n. s. (Plate V. figs. 1, 2.)

Shell rimate, ovately turreted, solid, white; length of spire and aperture equal; whorls $5\frac{1}{2}$, irregularly distantly longitudinally ribbed, flattened and excavated above, with a wide projecting keel, curving upwards and scalloped at the edge, running round the periphery of the whorls, which are encircled by scabrous ridges, fine and close-set above the keel, stouter, wider apart, and more squamate below, one ridge (intermediate between the keel of the body-whorl and the base) being larger and more elevated than the others; aperture semi-oval; outer lip sulcate within; columella nearly straight; umbilical region bordered by an elevated squamose ridge; canal very short, slightly twisted and recurved.

Diam. 11 lines, alt. 1 in. 2 lines.

Hab. Unknown.

This beautiful species of *Latiaxis* has been placed in my hands for description by Mr. Robert Geale.

5. Notes on *Conurus hilaris* and other Parrots of the Argentine Republic. By Dr. H. Burmeister, F.M.Z.S.

[Received November 19, 1877.]

During my residence at Tucuman, in the years 1859–60, I saw several flights of six or eight of a long-tailed parrot, of which I was not able to obtain a specimen, although the birds came every week during the maturing-time of the Indian corn to the garden of the house in which I lived, and did much damage to the seeds of the plants cultivated there. This bird, while it had the same habit of plundering the gardens as the other Parrots inhabiting this country (for example *Conurus patagonus* and *C. murinus*), was also, like its fellows, very cautious, some of them keeping watch on the top of the highest plants, and, as soon as any one appeared with gun in hand, giving a quick cry of alarm, upon which the whole flock flew away. On this account I was unable to obtain a single specimen of this beautiful bird, which I have not seen in any other part of this country, and which I recognized at once, even at a distance, as new to my collection, from its large red front. At last I found a living specimen in the possession of a shop-keeper, who would not part with it, having reared it from the nest and made a great favourite of it. But I was able to observe more carefully the specific distinctness of this bird than from a distance; and from this examination I made the description published in my 'Reise durch die La Plata-Staaten,' vol. ii. p. 442, as follows:—

Size and colour of *Conurus murinus*; whole plumage bright green, only the forehead at the base of the bill blood-red. Bill, in life, pale rose-colour, or quite white in old individuals. Carpal region green; the wing-feathers blackish, becoming bluer towards the margins. Tail narrow and cuneiform, greenish towards the margins, red at the base and below. Legs light flesh-colour. Iris orange. Whole length 10 inches, wing 5, tail $4\frac{1}{2}$.

This short description, the only one I was able to give at the time, was not sufficient to make the species thoroughly known. I therefore wrote to my friends at Tucuman, as soon as I returned to Buenos Aires in the year 1862, to send me specimens of this interesting Parrot; but all my solicitations, though repeated many times, were without effect. I never obtained a single specimen, although the bird is not rare in the vicinity of the large forests on the western sides of the town, near the slopes of the mountains, and sometimes very common.

At last my friend Dr. Bruland, physician at Tucuman, an excellent collector who had forwarded me many interesting objects for my collection, brought me two well-preserved skins; and some months before, Mr. Holmberg, of Buenos Aires, who made a journey to collect zoological objects in the northern provinces, brought home from Salta a skin of the same species, which I was able to compare with the other two now in the Public Museum of Buenos Aires.

These three skins enable me to give the following full description.

Beginning with the size, I find that the living specimen I examined must have been very young, and by no means fully adult, as the three skins now under my inspection are all larger. The two largest measure from the front to the tip of the tail 13 inches, and the smaller specimen (from Salta) 12 inches, tail $6\frac{1}{2}$ inches, and the wings $7\frac{1}{2}$–$7\frac{3}{4}$.

The predominating colour is pure green, somewhat darker on the upperside, more especially on the head and neck, but clearer on the underside; the wing- and tail-feathers are of the same colour outside, both with black shafts, and the former with a blackish interior margin inclining to blue. The inside of these above-mentioned feathers is yellowish grey, darker on the margins, and the yellow colour clearer on the tail-feathers towards the base, which in some specimens are of an orange appearance.

There is no red on these feathers in any of the three specimens; but it is possible that when alive it may have had this colour, if not very distinct, at least visible. I find in one of these specimens a red spot on two of the tail-coverts, which are generally completely green.

The red colour is regular only on the front of the head, beginning from the base of the upper mandible, extending up to and behind the eye; but a small space of green appears over the middle of the eye, and descends on the cheeks to the ear and the under mandible, with some green feathers near the angle of the mouth.

At first these red feathers are very small and of a dark red-brown, and thence the others become blood-red. Besides this regular frontal patch there are other red feathers on other parts of the body, but without any constant regularity in different specimens of the same species. I find in my three examples great difference in the distribution of these red feathers.

There generally seem to exist some red feathers on the neck, front of the throat, and breast; also there is always a circle of red feathers at the end of the tibia.

As to the habits and manner of living of this bird, I cannot add any thing to what I have already said at the commencement of this communication. It lives only in the northern mountainous districts of the Argentine Republic, never coming to the plains of the Pampas.

I take this occasion to correct some mistakes made by Dr. Finsch in his work, respecting my previous communications on different species of Parrots of this country and of Brazil.

The author says (vol. i. p. 174) that he knowns nothing of the spines on the sides of the tongue of the *Aræ*, mentioned by me in my work on the Animals of Brazil. In that work (vol. ii. p. 152) I described the tip of the tongue of this genus as like a stalk in form (*stängelförmig*). But this German word was a mistake of my printers. I wrote "*stämpelförmig*" (shaped like a pestle), comparing the thick fleshy tongue of the *Aræ* (although not entirely

cylindrical) to that instrument, but by no means to that of a stalk of a flower or fruit, to which the tongue has no resemblance.

I have at this very moment under my inspection the tongue of a large *Macrocercus macao* (*Sittace chloroptera*, Gray), which recently died in the house of one of my friends. This tongue has on each side, behind the two fringed lobes, with which the tongue of all parrots terminate, several large spines.

In the tongue of *Bolborhynchus murinus* I find no spines in the same place.

In volume i. of the same work, Dr. Finsch thinks it surprising (*auffallend*) that I have not mentioned that *Conurus nanday* also inhabits the Argentine Republic, although the specimen in Mr. Sclater's collection came from Buenos Aires. This latter fact may be true; but I am still more surprised to find that Dr. Finsch thinks that all specimens coming from Buenos Aires must necessarily have lived in this country. The species alluded to is by no means an inhabitant of the Argentine Republic, but comes only from Paraguay, and is often brought to Buenos Aires alive, as the bird is here considered a great rarity. That it lives also at Bolivia I have never heard here in Buenos Aires, though I have had a living specimen in my room for a long while, which was very tame, and would stand on my shoulder and remain in this position while I took long walks. At last I gave it to a friend of mine who was going to Europe, with the instruction that after its death it was to be put in the collection at Halle.

The description of this bird given by Dr. Finsch is not entirely correct. The head has no blackish brown on the front and vertex, but is entirely black, the brown colour being the consequence of the skin being old and dry.

In vol. ii. part 1, p. 116, of Dr. Finsch's work, the *Bolborhynchus monachus* is named "*calita*." The orthography of this term is erroneous, the bird, which is very common in all parts of the Argentine Republic, being called always *catita*. Again, Dr. Finsch says the two sexes do not differ; but I find the breast of the male of a much clearer grey than that of the female, and that it has very distinct, darker and clearer transverse stripes, while the latter are wanting in the female, which has an obscure grey-coloured breast, with a trace of brown-grey, which is not seen at all in the male.

In the young state both sexes are alike.

In vol. ii. p. 126, Dr. Finsch describes my *Bolborhynchus rubrirostris* from the young specimen sent by myself to the Bremen Museum, and blames me for not mentioning the blue-grey-greenish colour on the throat and breast. But this colour is not persistent, but is only found in the young bird (of the first year). The adult bird is entirely clear green on the breast, the same as on the neck and the whole body. From the young state of the specimen examined by Dr. Finsch results also the discrepancy in the length of the wing, which measures 5 inches in the old bird, and not 3″ 10‴ as he says.

6. Reports on the Collection of Birds made during the Voyage of H.M.S. 'Challenger.'—No.VI. On the Birds of Ternate, Amboyna, Banda, the Ké Islands, and the Aru Islands. By T. Salvadori, C.M.Z.S.

[Received November 26, 1877.]

The collection of birds made at the above-mentioned localities is not very large, numbering only 131 specimens, belonging to 79 species. None of these are new to science; but some are of special interest, as having been described quite recently or as being new to the locality where now they have been found.

I propose to treat of them separately, according to the localities.

I. *Birds from Ternate.*

[The ship arrived at Ternate on the evening of the 14th October, 1874, and sailed from Ternate at 11 A.M. on the 17th Oct. 1874. —*J. M.*]

The birds are only 12 in number, and belong to 10 species; a specimen of *Lorius cyanauchen*, although bought alive at Ternate, must have been brought there from a very different and far-away locality.

1. Scops morotensis, Sharpe.

Scops morotensis, Sharpe, Cat. Strig. p. 75, pl. vii. f. 1 (1875), (type examined).

[No. 325. Male: eyes yellow; stomach contained large grasshoppers.—*J. M.*]

One "male" (No. 325) in the dark rufous plumage.

All the specimens from Ternate which I have seen agree better with the form from Morty than with that from Halmahera, *S. leucospilus* (G. R. Gr.).

I know of other instances in which the birds inhabiting the small islands surrounding Halmahera, although very far one from the other, agree better *inter se* than with the form inhabiting the mainland.

2. Tanygnathus megalorhynchus (Bodd.).

Psittacus megalorhynchus, Bodd. Tabl. Pl. Enl. p. 45 (1783) (ex Buffon, Pl. Enl. 713).

Eclectus megalorhynchus, Schleg.; Finsch, Die Papag. ii. p. 351 (1870).

[No. 337. Male: eyes white; bought alive at Ternate.—*J. M.*]

3. Eclectus roratus (Müll.).

Psittacus roratus, Müll. S. N. Suppl. p. 77 (1776) (♀); Cass. Pr. Ac. Nat. Sc. Philad. 1864, p. 240. no. 52.

Psittacus grandis, Gm. S. N. i. p. 335. no. 102 (1788) (♀).

Eclectus grandis, Wagl.; Finsch, Die Papag. ii. p. 340 (1868).

Eclectus polychlorus, ex Batchian, Halmahera et Ternate, auctt. (nec Scop.) (♂); Finsch, Die Papag. ii. p. 393 (partim) (1868).

[336. Male: eyes yellow. 361. Female: this is the female of No. 336; it was purchased along with others at Ternate and kept alive on board till the 28th Oct., when it was killed and skinned, as it proved a nuisance while alive.—*J. M.*]

Two specimens bought alive at Ternate, a "male" (No. 336) green and a "female" (No. 361) red; this one is very interesting, having some green feathers among the scapularies.

Both specimens are much smaller than the birds which I have seen from Halmahera.

4. LORIUS DOMICELLA (Linn.).

Psittacus domicella, Linn. S. N. i. p. 145. n. 26 (1766).
Domicella atricapilla, Wagl.; Finsch, Die Papag. ii. p. 763 (1868).

[No. 325. Male: eyes red.—*J. M.*]

One "male" (No. 335) not fully adult, bought alive at Ternate[1].

6. CYANALCYON DIOPS (Temm.).

Alcedo diops, Temm. Pl. Col. 272 (1824) (type examined).
Halcyon diops, Steph.; Sharpe, Mon. Alced. pl. 77 (1868–1871).

[No. 334. Male: eyes black; stomach had insects.—*J. M.*]

7. PACHYCEPHALA MENTALIS, Wall.

Pachycephala melanura, part., Bp. Consp. i. p. 388 (ex Moluccis) (1850); G. R. Gr. (nec Gould), P. Z. S. 1860, p. 353; Schleg. Ned. Tijdschr. voor de Dierk. iv. p. 44 (1871).
Pachycephala albicollis, Temm. Mus. Lugd. (nec Lafr.) (Bp. *l. c.*).
Turdus armillaris, Temm. (Bp. *l. c.*).
Lanius cuculiatus, Licht. (Bp. *l. c.*).
Pachycephala mentalis, Wall. P. Z. S. 1863, p. 30 (type examined).
Pachycephala nigrimentum, G. R. Gr. Hand-list, i. p. 388. sp. 5880 (1869), descr. nulla (type examined).

[No. 333. Male: stomach had insects.—*J. M.*]

8. CYRTOSTOMUS FRENATUS (S. Müll.).

Nectarinia frenata, S. Müll. Verh. Land- en Volkenk. p. 173 (note) (1843).
Cinnyris frenatus, Shelley, Mon. Cinnyr. pt. iii. (1877).
Cyrtostomus frenatus, Salvad. Atti R. Ac. Sc. Tor. xii. p. 317 (1877).

[1] 5. LORIUS CYANAUCHEN (Müll.).

Psittacus cyanauchen, S. Müll. Verhandl. Land- en Volkenk. p. 107 (1839–1844) (type examined).
Domicella cyanauchen, Finsch, Die Papag. ii. p. 773 (1868).
Domicella lory mysorensis, Meyer, Sitzb. k. Ak. Wiss. Wien, lxx. p. 233 (1874).

[No. 335. Male: eyes red.—*J. M.*]

One "male" bought alive at Ternate, but certainly brought there from the Island of Mysore, in Geelvink Bay, where only *L. cyanauchen* lives in the wild state.

[327. Male: eyes brown; stomach had insects. 329. Female. —*J. M.*]

9. Hermotimia auriceps (G. R. Gr.).

Nectarinia auriceps, G. R. Gr. P. Z. S. 1860, p. 348.

Hermotimia auriceps, Salvad. Atti R. Ac. Sc. Tor. x. p. 228 (1874).

Cinnyris auriceps, Shelley, Mon. Cinnyr. pt. v. (1877).

[No. 326. Male: eyes brown; stomach had insects.—*J. M.*]

10. Totanus glareola (Linn.).

[No. 330. Female: eyes brown; stomach contained shells.—*J. M.*]

II. *Birds from Amboyna.*

[The 'Challenger' arrived at Amboyna on Sunday 4th Oct., 1874, and sailed from Amboyna on the 10th Oct., 1874, at 4 P.M..—*J. M.*]

During the stay 23 birds were procured, representing 15 species, as follows[1]:—

1. Urospizias iogaster (S. Müll.)

Falco hiogaster, S. Müll. Verh. Land- en Volkenk. p. 110, note (1839–1844) (type examined).

Astur hiogaster, Sharpe, Cat. Accipitr. p. 104 (1874).

[No. 302. Male: eyes coral-red; legs orange; stomach had fish-bones and crabs.—*J. M.*]

2. Geoffroyus rhodops (G. R. Gr.).

Psittacus fuscicapillus, Vieill. N. D. xxv. p. 316, Java! (1817), (descr. falsa; type examined) (♀).

Psittacus rhodops, G. R. Gr. P. Z. S. 1861, p. 436, Waigiou! and Mysol! (descr. nulla; type examined).

Eclectus rhodops, Schleg. Mus. P.-B. *Psittaci*, p. 43 (1864), Ceram, Amboyna, and Bouru.

Pionias rhodops, part., Finsch, Die Papag. ii. p. 380 (1868).

Geoffroyus schlegelii, Salvad. Ann. Mus. Civ. Gen. x. p. 29. no. 40, Buru, Boano, Ceram, Amboyna, Arouko, Goram, Monawolka (1877).

[No. 304. Male: eyes white; bill, upper part reddish, lower blackish.—*J. M.*]

This species resembles *G. aruensis* (G. R. Gr.); but it is larger, has the under wing-coverts of a darker blue, and the female has a darker brown head.

The type of *Psittacus fuscicapillus*, Vieill., is certainly a female of this species; but the description is wrong, as also the locality.

Psittacus rhodops, G. R. Gr. (*l. c.*), was said to be from Waigiou and Mysol; but knowing that in these islands lives a representative

[1] [Besides the skins examined by Count T. Salvadori, two Cassowaries were procured alive, and the skins afterwards preserved. They appear to be immature examples of *Casuarius galeatus*, or of a very closely allied species.—P. L. S.]

form, *Geoffroyus pucherani*, Bp., I thought that it could not be the same bird as *Eclectus rhodops*, Schleg., from the Ceram group; accordingly I gave to Schlegel's species the name of *Geoffroyus schlegelii*. Having, however, quite recently seen Gray's types in the British Museum, I find that they really belong to the Ceramese species; and I am quite sure that the localities Waigiou and Mysol are wrong. Those specimens no longer bear Wallace's original labels, which circumstance may explain how it was that wrong localities have been attributed to them.

3. CEYX LEPIDA, Temm.

Ceyx lepida, Temm. Pl. Col. 595. f. 1, Amboyna (1836); Sharpe, Mon. Alced. pl. 46 (pt. ii. 1868).

[No. 303. Female: bill and legs red; eyes black; stomach had insects.—*J. M.*]

4. MACROPTERYX MYSTACEA (Less).

Cypselus mystaceus, Less. Voy. Coq. Zool. Atlas, pl. 22 (1826) (type examined).

Macropteryx mystacea, Salvad. Ann. Mus. Civ. Gen. x. p. 311. sp. 1 (1877).

[298. Male; 299. Female: eyes black; stomach had insects. —*J. M.*]

Two specimens—one "male" (No. 298), with the brown spot on the ear-coverts, and one female (No. 299), without the brown spot.

5. CYRTOSTOMUS ZENOBIA (Less.).

Cinnyris zenobia, Less. Voy. Coq. Zool. Atlas, pl. 30. f. 3 (1826), i. 2, p. 679 (1828)[1].

Cinnyris clementiæ, Less. Dict. Sc. Nat. i. p. 18 (1827).

Cyrtostomus melanogaster, G. R. Gr. Hand-list, i. p. 112. sp. 1390 (1869), descr. nulla.

Cyrtostomus zenobia, Salvad. Atti R. Ac. Sc. Tor. xii. p. 319 (1877).

[No. 308. Male; 312. Female; 313. Male: eyes black; stomach contained insects.—*J. M.*]

Three "males" (No. 308, 312, 313), apparently fully adult; all three have the feathers of the forehead tipped with metallic blue; one of them (No. 313) has the upper parts more greenish than the other two, which have the same parts of a rich olive-brown.

6. HERMOTIMIA ASPASIOIDES (G. R. Gr.).

Nectarinia aspasioides, G. R. Gr. P. Z. S. 1860, p. 348, Amboyna.

Hermotimia aspasioides, Salvad. Atti R. Ac. Sc. Tor. x. p. 208, 216 (1874), xii. p. 306 (1877).

Cinnyris aspasioides, Shelley, Mon. Cinnyr. pt. v. (1877).

[1] I have not been able to find the type of this species in the Museum of Paris.

[314. Male: eyes black. 312. Female: eyes black; stomach had insects.—*J. M.*]

Two specimens—one "male" (No. 314) not fully adult, with the green cap mixed with blue, and one "female" (No. 312).

7. Dicæum vulneratum, Wall.

Dicæum vulneratum, Wall. P. Z. S. 1863, p. 32, note (Ceram; type examined).

[No. 315. Female: eyes brown; stomach had insects and seeds. Small bird.—*J. M.*]

This sex has not yet been described.

Fem. *Superne cinereo-fusca, alis et cauda obscurioribus, paullum nitentibus; pileo præsertim frontem versus brunneo tincto; supracaudalibus rubris; inferne cinerea; gastræo medio seu gula, colli antici, pectoris abdominisque parte media et subcaudalibus albis; rostro et pedibus fuscis.*

8. Budytes viridis (Gm.).

[305. Male: eyes brown; legs and bill black; stomach had insects. 310. Female: eyes brown. 319. Male: eyes brown; stomach had insects.—*J. M.*]

Three specimens—one "male" (No. 305) and one "female" (No. 310) scarcely different, and one "male" (No. 319) with the underparts of a paler yellow, and with the back rather greyish.

9. Macropygia amboinensis (Linn.).

[301. Male: eyes red; feet red; bill black; fruit in stomach. 320. Female: eyes orange; stomach had seeds; legs red.—*J. M.*]

Two specimens—one fully adult "male" (No. 301), and one "female" (No. 320). The female has the cap of a uniform cinnamon colour, the breast more reddish than the male, and no green or purplish reflections on the nape, which is finely mottled with dark brown and reddish fulvous.

10. Charadrius fulvus (Gm.).

[No. 317. Male: eyes hazel; stomach contained worms and land-shells.—*J. M.*]

11. Eudromias veredus (Gould).

Charadrius veredus, Gould, P. Z. S. 1848, p. 38; id. B. Austr. vi. pl. 14.

Eudromias veredus, Harting, Ibis, 1870, p. 209, pl. vi.

[No. 318. Male: eyes hazel; stomach contained worms and land-shells.—*J. M.*]

12. Ægialitis geoffroyi (Wagl.).

Charadrius geoffroyi, Wagl. Syst. Av. gen. *Charadrius*, sp. 19 (1827).

Ægialitis geoffroyi, Harting, Ibis, 1870, p. 378, pl. xi.

[No. 311. Male: eyes brown.—*J. M.*]

13. TRINGOIDES HYPOLEUCUS (Linn).

[No. 306. Female: eyes hazel; stomach had insects.—*J. M.*]

14. GALLINAGO STENURA (Kuhl).

"*Scolopax stenura*, Kuhl," Bp. Ann. Stor. Nat. iii. fasc. x (1830).
Gallinago stenura, Schleg. Mus. P.-B. *Scolopaces*, p. 12 (1864); Salvad. Cat. Syst. Ucc. di Borneo, p. 334. sp. 353 (1874).

[No. 316. Male: eyes black; stomach had worms.—*J. M.*]

15. BUTORIDES JAVANICA (Horsf.).

Ardea javanica, Horsf. Trans. Linn. Soc. xiii. p. 190 (1820); Schleg. Mus. P.-B. *Ardeæ*, p. 43 (1863).
Butorides javanica, Salvad. Cat. Ucc. di Borneo, p. 351. sp. 370 (1874).

[No. 300. Male: eyes orange; legs yellow; bill black; crustacea in stomach. 309. Female: eyes yellow; legs green.—*J. M.*]
Two specimens—one "male" (No. 300) fully adult, and a young "female" (No. 309).

III. *Birds from Banda.*

[The 'Challenger' arrived at Banda on the 29th September, 1874, and sailed from Banda on the evening of the 2nd October, 1874.—*J. M.*]
Only 10 specimens, belonging to 7 species, are in the collection, which, although a very small one, is of some interest, as birds from Banda are rather scarce in Museums.

1. SAUROPATIS CHLORIS (Bodd.).

[No. 293. Male; 294. Female: eyes black; legs have a dull brown tinge; base of the lower mandible white, the rest black.—*J. M.*]

2. MONARCHA INORNATUS (Garn.).

Muscicapa inornata, Garn. Voy. Coq. Zool. Atlas, pl. 16. f. 2 (1826), & i. 2, p. 591 (1828), New Guinea (type examined).
Drymophila cinerascens, Temm. Pl. Col. 430. f. 2 (1827), Timor (type examined).
Monarcha fulviventris, Hartl. P. Z. S. 1867, p. 830, Echiquier Islands (type examined).

[No. 292. Male: eyes brown; legs and bill slate-blue; the bill lighter than legs; stomach contained insects.—*J. M.*]
After having examined the types mentioned above and having compared together many specimens from Timor, Banda, Amboyna, Goram, Tijoor, Ternate, Halmahera, Batchian, Tifore, Sula, Ké Islands, Aru Islands, Mysol, New Guinea (Sorong, Dorei, and Mannam), Mafor, the Admiralty Islands, and the Echiquier group, I have arrived at the conclusion that they all belong to one species. The *Drymophila cinerascens*, Temm., represents the fully adult bird;

and the *Muscicapa inornata*, Garn., is the young stage of the same, differing from the adult in the reddish colour of the outer edgings of the remiges. Under the name of *M. fulviventris* Hartlaub has described a specimen from the Echiquier group, with the abdomen rather pale, exactly like others from the other localities mentioned above.

3. Rhipidura squamata, S. Müll.

Rhipidura squamata, S. Müll. Verh. Land- en Volkenk. p. 189 (1839–1844), Banda (type examined).

Rhipidura griseicauda, Salvad. Ann. Mus. Civ. Gen. vii. p. 924. sp. 20 (1875), Waigiou.

[No. 289. Female: eyes hazel; stomach contained insects.—*J. M.*]

This species is allied to *R. rufifrons* (Lath.) from Australia, from which it differs in having the forehead black in the middle and white on the sides; the tail is grey, white-tipped, and with scarcely any reddish colour near the base. S. Müller described this species with the tail brown-black, instead of grey; and this mistake made me believe that the bird from Waigiou, described by me, was different.

4. Pachycephala phæonota (Müll.).

Myiolestes phajonotus, Müll. Mus. Lugd. (type examined); Bp. Consp. i. p. 358 (1850), Banda.

Pachycephala brunnea, Wall. P. Z. S. 1865, p. 478, Banda, Salwatty (type examined).

Pachycephala senex, Pelz. Verh. k. zool.-bot. Gesellsch. Wien, 1872, p. 429, Aru (type examined).

[No. 290. Male; 291. Female: eyes light hazel; legs flesh-colour; stomach contained insects.—*J. M.*]

The sexes are exactly alike.

The types in the Museum of Leyden are marked "Borneo," which is a mistake; Bonaparte has given the exact locality.

This species has a very extensive range; I have seen specimens from Banda, Ceram-laut, Mysol, Salvatty, Waigiou, Mafor, Ternate, Dammar, Mareh, Motir, and Tifore. It is not quite certain that the bird described by Von Pelzeln (*l. c.*) was really from the Aru Islands.

5. Myzomela boiei, S. Müll.

Nectarinia (*Myzomela*) *boiei*, S. Müll. Verh. Land- en Volkenk. p. 172 (1839–44) (type examined).

[No. 295. Female: eyes brown; stomach had insects. The male of this bird had a red head; but no specimen was shot.—*J. M.*]

6. Zosterops chloris, S. Müll.

Zosterops chloris, S. Müll. in Mus. Lugd. (type examined); Bp. Consp. i. p. 398 (1850); Hartl. Journ. f. Orn. 1865, p. 24.

[No. 287. Male; 288. Female: eyes brown; legs slate-colour;

stomach contained insects. In flocks on trees near the shore.—*J. M.*]

The sexes are exactly alike.

To this species have been referred also specimens from Ternate and Bouru; but those from Ternate agree better with *Z. intermedia*, Wall., from Celebes; and one specimen from Bouru in the British Museum, collected by Wallace, belongs to a species not yet described.

7. CARPOPHAGA CONCINNA, Wall.

Carpophaga chalybura, G. R. Gr. (nec Bp.), P. Z. S. 1858, pp. 187, 196 (Aru).

"*Carpophaga chalybea*, Bp." (errore), Rosenb. Journ. f. Orn. 1864, p. 132. sp. 226 (Aru).

Carpophaga concinna, Wall. Ibis, 1865, p. 383. no. 52, Matabello Island, Aru (a small island west of) (type examined); Salvad. Ann. Mus. Civ. Gen. ix. p. 200. no. 39 (1876).

Carpophaga roseinucha, part., Schleg. Ned. Tijdschr. Dierk. iii. p. 197 (1865).

[No. 296. Female. This bird was sent on board alive as a present to the Professor.—*J. M.*]

IV. *Birds from the Ké Islands.*

[The ship arrived at Ké Doulan, Ké Islands, on the morning of the 25th September, 1874, and left on the morning of the 26th September.—*J. M.*]

The birds from Ké Islands are 25, representing 14 species; they have been all collected at the little island named Dulan[1].

The Ké Islands were quite unknown to naturalists before Wallace made a short stay there of six days in January 1857. He only obtained thirteen species in all[2], which were catalogued, together with those from the Aru Islands, by Mr. G. R. Gray[3]. Von Rosenberg made a longer stay on the Ké Islands, and collected there rather extensively; but no complete catalogue of his collection has been published. He gave an account of his visit to the Ké Islands, and of some of the birds collected there by him, in his 'Reis naar de zuidoostereilanden gedaan en 1865,' pp. 67–83.

Dr. Beccari in 1873 made a rather large collection of birds in the Ké Islands. Of this some of the new species have been already described by me[4]; but I propose to give a complete account of it as soon as my occupations permit.

[1] Cosmos di Guido Cora, ii. tav. ii. (1874).

[2] Ann. & Mag. Nat. Hist. (2), xx. p. 473 (1857).

[3] P. Z. S. 1858, pp. 169–198.

[4] "Nuove specie di uccelli delle Isole Aru e Kei, raccolte da Odoardo Beccari," Ann. Mus. Civ. Gen. vi. pp. 73–80 (1874); "Altre nuove specie di uccelli raccolte nella Nuova Guinea dal Signor L. M. D'Albertis e nelle Isole Aru e Kei dal Dott. O. Beccari," *op. cit.* vi. pp. 308–314; "Descrizione di sei nuove specie di uccelli delle Moluche, delle Kei e delle Isole Aru," *op. cit.* vii. pp. 983–990 (1875).

1. PANDION LEUCOCEPHALUS, Gould.

Pandion leucocephalus, Gould, P. Z. S. 1837, p. 138; id. B. Austr. i. pl. 6 (1848); Sharpe, Cat. Acciptr. p. 451 (1874).

[No. 268. Male: eyes yellow; legs whitish; bill black; stomach contained fish. Shot by Chauner; no others were seen. Shot far in the bush from the shore.—*J. M.*]

2. GEOFFROYUS KEYENSIS, Schleg.

Psittacus capistratus, G. R. Gr. (nec Bechst.), P. Z. S. 1858, p. 183 (♀), Ké Islands (type examined).

Eclectus personatus (part.), Schleg. Ned Tijdschr. Dierk. iii. p. 332 (A. grande forme (partim), p. 333) (1866); id. Mus. P.-B. *Psittaci*, Revue, p. 18 (partim) (1875).

Pionias rhodops (part.), Finsch, Die Papag. ii. pp. 388, 955 (1868).

Geoffroyus keyensis, Schleg. MS. (Finsch, Die Papag. ii. p. 956); Salvad. Ann. Mus. Civ. Gen. x. p. 29. sp. 37 (1877).

[No. 271. Male; 269, 270. Females: eyes white; upper mandible red in the male, both black in the females; stomach contained seeds and fruit.—*J. M.*]

Three specimens—a young "male" (No. 271) in transitional plumage, an adult "female" (No. 270) with the head pale brown olive, and a not fully adult "female" (No. 269) with the head conspicuously tinged with green.

3. EOS RUBRA (Gm.)

Domicella rubra, Finsch, Die Papag. ii. p. 786 (1868).

Psittacus (*Eos*) *bernsteinii*, Rosenb. Nat. Tijdschr. v. Ned. Ind. xxv. p. 145 (1863), Ké Islands.

Lorius squamatus, Schleg. (nec Bodd.), Mus. P.-B. *Psittaci*, p. 124. no. 1, 2 (1864) (types examined).

Domicella schlegelii, Finsch, Die Papag. ii. p. 792 (1868), Ké Islands (type examined).

[No. 272. Male; 273. Female: eyes light red; bill dull red; legs black; stomach contained seeds with some insects. Only two were shot. The Professor has one of the same species alive on board, bought at Ké Doulan.

No. 324. Female: eyes brown; legs black; bill rose-coloured. This bird was purchased alive at Ké Doulan, Ké Islands, and kept till today (Oct. 12, 1874) on board, and was killed on account of the noise it made.—*J. M.*]

Three specimens—one "male" (No. 272) and one "female" (No. 273) fully adult and alike, and a "female" (No. 324) not fully adult, with some of the feathers of the underparts edged with blue and turning to greenish in the hidden part.

The *Domicella schlegelii*, Finsch, *l. c.* (= *Lorius squamatus*, Schleg.), was established on some young birds, which have the feathers of the underparts edged with blue; the same thing happens in the young of *E. riciniata* and of *E. cyanogenys*.

4. Rhipidura assimilis, G. R. Gr.

Rhipidura assimilis, G. R. Gr. P. Z. S. 1858, p. 176, Ké Islands (type examined).

[No. 286. Male: insects in the stomach; eyes black.—*J. M.*]

This species is allied to *R. isura*, Gould, from Australia, and to *R. setosa* (Q. & G.) from New Ireland and New Guinea; it differs from the first in the larger dimensions, in the paler band across the breast, and in the spot at the tip of the two outer tail-feathers less extended and light fulvous instead of white; from *R. setosa* it is easily distinguished by the upper tail-coverts rufescent.

5. Graucalus pollens, Salvad.

Graucalus pollens, Salvad. Ann. Mus. Civ. Gen. v. p. 75 (1874).

[No. 280. Female: eyes black; stomach contained seeds; feet and bill black.—*J. M.*]

This specimen agrees entirely with the typical females described by me. This species comes next to *G. caledonicus* (Gm.) from New Hebrides and New Caledonia; but it differs in the dimensions being somewhat smaller and in the darker colour. It is also allied to *Gr. personatus*, Müll., from Timor; but it is larger, darker, and also conspicuously different in the under wing-coverts, which *are not white*, but dark like the rest of the plumage.

In the British Museum I have seen a *Graucalus*, said to have been collected by Wallace in the Sula Islands, and wrongly named *G. temmincki*, which is very much like the females from the Ké Islands, except that it is a little smaller.

6. Lalage karu (Less.).

Lanius karu, Less. Voy. Coq. Atlas, pl. 16 (1826).

Ceblepyris karu, Less. Voy. Coq. Zool. i. 2, p. 633 (1828) (type examined).

Lalage karu, Hartl. Journ. f. Orn. 1865, p. 168.

[Nos. 282, 283. Males: eyes black; stomach contained in the one seeds, in the other insects.—*J. M.*]

Two specimens, one "male" (No. 282) fully adult, with the upper parts shining black, the under wing-coverts pure white, and the breast and the abdomen barred across; this is exactly like another specimen from Naiabui, collected by Signor D'Albertis and marked female (!) (Ann. Mus. Civ. Gen. ix. p. 28. sp. 108, 1876). The second specimen (No. 283) is also marked "male:" it is not fully adult; it has the upper parts grey, and the under wing-coverts, as well as the underparts, tinged with reddish.

I suspect that to the same species must be referred the *Ceblepyris rufiventris*, Jacq. & Pucher., and I question whether it really was from Raffles Bay. The type of this species, examined by me in the Museum of Paris, agrees entirely with two specimens from the Aru Islands, collected by Beccari, and which are exactly like the type of *Lalage polygrammica*, G. R. Gr., also from the Aru Islands.

7. DICRUROPSIS MEGALORNIS (G. R. Gr.).

Dicrurus megalornis, G. R. Gr. P. Z. S. 1858, pp. 199, 193, Ké Islands (type examined).

Chibia megalornis, Sharpe, Cat. Birds in the Brit. Mus. iii. p. 242. no. 9 (1877).

[Nos. 274, 275. Both females: eyes red; legs and bill black; stomach contained insects.—*J. M.*]

This bird and the other allied Austro-Malayan species have been united by Mr. Sharpe to the genus *Chibia*, Hodgs., the type of which, *Chibia hottentotta* (Linn.), has a much longer and more acute bill, and is also very conspicuous for the tuft of silky hairs springing from the forehead—a feature which, among the Austro-Malayan species, is only to be found in *Dicrurus pectoralis*, Wall., from the Sula Islands[1].

8. PHILEMON PLUMIGENIS (G. R. Gr.).

Tropidorhynchus plumigenis, G. R. Gr. P. Z. S. 1858, pp. 174, 191, Ké Islands (type examined).

[No. 276. Male; 277. Sex uncertain: eyes brown; stomach contained seeds.—*J. M.*]

Both are young birds, with the feathers of the sides of the breast with broad yellow edges, and with the outer edges of the remiges tinged with olive.

9. CALORNIS METALLICA (Temm.).

Lamprotornis metallicus, Temm. Pl. Col. 266, 1824, Amboyna (type examined).

Calornis viridescens, G. R. Gr. P. Z. S. 1858, p. 181, Aru Islands (type examined).

Calornis nitida, G. R. Gr. P. Z. S. 1858, p. 181, New Ireland (type examined).

Calornis amboinensis, G. R. Gr. P. Z. S. 1858, p. 182, Amboyna (type examined).

Calornis gularis, G. R. Gr. P. Z. S. 1861, p. 431, Mysol (type examined).

Calornis purpurascens, G. R. Gr. Hand-list ii. p. 26. no. 6377, (1870), Goram (type examined).

[No. 284. Female: eyes red; stomach contained seeds; caught by Suhm in a spider's web.—*J. M.*]

One fully adult "female" (No. 284), resembling a fully adult male.

This species has been found in nearly all the Moluccan and Papuan Islands, from the Sula Islands westward to the Soloman Islands eastward, and lives also in the northern part of Australia.

Temminck, in the text of the 'Planches Coloriées,' says that his

[1] I think that the Austro-Malayan species may be more properly referred to a peculiar genus, which I propose to call *Dicruropsis*, characterized as follows:—*Rostrum crassum, rostro specierum generis* Dissemuri *simile, sed culmine minus acuto, crassiusculo; cauda bifida divaricata, rectricibus extimis superne introrsum paullum convolutis.*

L. metallicus was from Timor and Celebes; but this seems to be a mistake, as the typical specimens in the Museum of Leyden, examined by me, are from Amboyna. In Celebes and in Timor lives another species of the genus *Calornis*, and not *C. metallica*.

Specimens from the different localities do not differ specifically: those from Cape York are somewhat more purplish, but not always in the same way; one from Goram, a small island near Amboyna (*C. purpurascens*, Gray), is exactly like some specimens from Cape York.

Some specimens have the throat more purplish than others; one from Mysol (*C. gularis*, Gray) cannot be separated from others from Halmahera and Cape York.

10. CARPOPHAGA CONCINNA, Wall.

[Nos. 263–264. Males; 265, 266, 267. Females: eyes between orange and a coral-red; the stomach in all contained fruit and seeds; legs coral-red; bill black. There were a great many of these Nutmeg Pigeons shot, enough for lunch for the whole ward-room. They were very good eating.—*J. M.*]

11. MYRISTICIVORA BICOLOR (Scop.).

Myristicivora bicolor, Salvad. Ann. Mus. Civ. Gen. ix. p. 276 (1877).

[No. 278. Male: white Pigeon; eyes brown; stomach contained fruit; feet blue; bill black.—*J. M.*]

This bird has the under tail-coverts entirely white.

In a recent paper of mine[1] I have shown that *M. bicolor* (Scop.), *M. spilorrhoa* (G. R. Gr.), and *M. melanura*, G. R. Gr., are perfectly distinct species, and that *M. bicolor* (Scop.) most likely is a migratory bird in the Moluccas, as it is in Celebes, and that, while in Celebes it is to be found together with *M. luctuosa* (Reinw.), in the Moluccas it lives together with *M. melanura*, Gray.

12. MACROPYGIA KEYENSIS, Salvad.

Macropygia, sp., Wall. Ann. & Mag. Nat. Hist. (2) xx. p. 473 (partim), 1875, Ké Islands.

Macropygia phasianella, part., G. R. Gr. (nec Temm.), P. Z. S. 1858, pp. 187, 196, Ké Islands; Wall. Ibis, 1865, p. 389. sp. 81 (partim); Rosenb. Reis naar zuidoostereil. p. 81 (1867).

Macropygia turtur, part., Schleg. Mus. P.-B. *Columbæ*, pp. 110, 113, 114 (specimina Ins. Key), 1873.

Macropygia keyensis, Salvad. Ann. Mus. Civ. Gen. ix. p. 204. sp. 64 (1876).

[No. 279. Male: eyes hazel; stomach contained seeds; legs red; bill black.—*J. M.*]

I named this Ké-Islands species (*l. s. c.*) before seeing a fully adult bird, feeling quite confident, from Schlegel's description, that it was really distinct. I have recently seen the adult specimens contained in the Leyden Museum, and I am satisfied that the Ké-

[1] "Osservazioni intorno alle speci del genere *Myristicivora*, Rchb." (Ann. Mus. Civ. Gen. ix. pp. 265–277).

Islands bird belongs to a peculiar form. I shall now give a full description of the adult bird collected during the 'Challenger' expedition, and shall proceed after to point out the principal differences from the allied forms.

Capite rufo-vinaceo, sincipite et genis pallidioribus; vertice et occipite grisescentibus; collo postico viridi et purpureo nitente, conspicue cinerascente; dorso, uropygio, supracaudalibus alarumque tectricibus exterioribus brunneo-cinnamomeis, punctulis nigris obsoletis adspersis; gula rufescenti-albida; collo antico et pectore summo vinaceis, fasciolis transversis nigris notatis; pectore imo et abdomine albido-fulvescentibus, fasciolis transversis nigris notatis; abdominis lateribus et subcaudalibus brevioribus pallide cinnamomeis, nigro transfasciolatis; subcaudalibus longioribus et tectricibus alarum inferioribus cinnamomeis unicoloribus; remigibus fuscis, exterius cinnamomeo limbatis; cauda superne brunneo-grisescente, inferne pallidiore et magis grisescente; rectricibus tribus utrinque lateralibus partim læte rufis, fascia lata subapicali nigra notatis; rostro nigro; pedibus rubris.

Long. tot. circa $0^{m}{\cdot}370$; al. $0^{m}{\cdot}018$; caud. $0^{m}{\cdot}190$; rostr. $0^{m}{\cdot}018$; tarsi $0^{m}{\cdot}021$.

This species is intermediate between *M. amboinensis* (Linn.) and *M. doreya* (Bp.).

It differs from *M. amboinensis* (which it much resembles in the light underparts):—

1st. In the greyish tinge of the vertex, of the occiput, and of the hind neck;

2nd. In the more vinaceous colour of the front neck;

3rd. In the more whitish underparts;

4th. In the darker hue of the back;

5th. In the larger dimensions.

From *M. doreya*, Bp., to which it bears a great resemblance in the upper parts, it differs:—

1st. In the more greyish hind neck;

2nd. In the much less vinaceous front neck and upper breast;

3rd. In the more whitish underparts;

4th. In the lighter and more greyish tail;

5th. In the larger dimensions.

13. Tringoides hypoleucus (Linn.).

[No. 285. Eyes black; stomach contained portion of shells.—*J. M.*]

14. Numenius uropygialis, Gould.

[No. 281. Female: eyes black; stomach contained crustacea (crabs).—*J. M.*]

In my Catalogue of the Birds of Borneo I have referred this eastern form to *N. phæopus* (Linn.); but now I think that *N. uropygialis*, Gould, with the uropygium constantly mottled with dark grey, is entitled to specific rank.

V. *Birds from the Aru Islands.*

[The ship arrived at Dobbo, Aru Islands, about noon on the 16th September, 1874. The same afternoon some birds were shot near the village of Dobbo; these were all put in spirits. On the 17th a large party landed on the island of Wokan and shot thirty-two specimens. On the 19th September thirteen specimens were shot at Wanumbai, and on the afternoon of the 22nd and morning of the 23rd seventeen more. The ship left Aru on the morning of the 23rd September, 1874, at 6 P.M.—*J. M.*]

The birds collected in the Aru Islands are 61, belonging to 40 species; they are from three different localities—Wokan, Wanumbai, and Dobbo, already visited by Wallace, Von Rosenberg, or Beccari.

Only one species, *Drymaœdus beccarii*, lately described by me from the Arfak Mountains, is new to the islands.

1. CUNCUMA LEUCOGASTER (Gm.).

Haliaëtus leucogaster, Sharpe, Cat. Accipitr. p. 307 (1874).

[No. 262. Female: eyes yellow; stomach contained fish. Shot on Wokan on 21st September. Skinned by Crosbie.—*J. M.*]

This bird is in transitional plumage, like the specimen figured by Schlegel, Valkvog. pl. 4. f. 2.

2. HALIASTUR GIRRENERA (Vieill.).

Haliaëtus girrenera, Vieill. Gal. Ois. i. p. 31 (syn. emend.), pl. x. (1825) (type? examined).

[No. 235. Male: eyes red; stomach contained crabs and cuttle-fish. Shot on Wokan.—*J. M.*]

I have found in the Museum of Paris a specimen marked "Papous (Freycinet, 1820)," which seems to be the type of Vieillot.

3. UROSPIZIAS POLIOCEPHALUS (G. R. Gr.).

Accipiter poliocephalus, G. R. Gr. P. Z. S. 1858, pp. 170, 189, Aru Islands (type examined); Sclat. Ibis, 1859, p. 276, 1860, p. 322, pl. x. (fig. avis adultæ tantum); Rosenb. Nat. Tijdschr. Ned. Ind. xxv. p. 228. n. 47 (1863); id. Journ. f. Orn. 1864, p. 116. n. 47; Kaup, P. Z. S. 1867, p. 177; Wall. Ibis, 1868, p. 12 (partim); Salvad. Ann. Mus. Civ. Gen. vii. p. 75, sp. 7, Ansus (1875).

Nisus poliocephalus, part., Finsch, New Guin. p. 155 (1865); Schleg. Ned. Tijdschr. Dierk. iii. p. 326 (partim) (1866); id. Mus. P.-B. Revue Accipitr. p. 88 (1873); Gieb. Thes. Orn. ii. 711 (1875).

Urospiza poliocephalus, G. R. Gr. Hand-list, i. p. 34. sp. 336 (1869).

Astur poliocephalus, Rosenb. Reis naar zuidoostereil. p. 36 (1862); Sharpe, Cat. Accipitr. p. 117 (specim. *a*, *b* tantum) (1874).

Urospizias poliocephalus, Gurn. Ibis, 1875, p. 365.

Astur contumax, Rosenb. Reis naar zuidoostereil. p. 36 (Aru), descr. nulla (1867).

Urospizias spilothorax, Salvad. Ann. Mus. Civ. Gen. vii. p. 900. sp. 1 (1875), Arfak and Jobi, x. pp. 115, 117. sp. 5 (1877).

Accipiter etorques, part., Sclat. P. Z. S. 1877, p. 109. n. 45 (young specimen).

[No. 253. Male, from Wanumbai.—*J. M.*]

This bird is young.

I have found in the museums of Leyden and Berlin two specimens which are very much like my *U. spilothorax*; but they have only a few longitudinal dark spots on the lower part of the breast, showing that these spots are not a permanent character, and that my *U. spilothorax* represents only a stage of *U. poliocephalus*.

4. Microglossus aterrimus (Gm.).

[No. 206. Wokan. Male: eyes black; cheek-membrane red; stomach contained many of the insides of kernels of nuts. This was shot on the top of one of the highest trees. Only one seen at the time.—*J. M.*]

I have seen many specimens from the Aru Islands, and these are in general much smaller than those from New Guinea; and I think that the type of *Psittacus alecto*, Temm., which I have seen in the Museum of Leyden, must have come from the Aru Islands[1]. I do not think that there is more than one species of the genus *Microglossus*.

5. Cyclopsittacus melanogenys (Rosenb.).

"*Psittacula melanogenia*, Rosenb." Schleg. Ned. Tijdschr. v. Dierk. iii. p. 330 (1866), Aru (type examined); Rosenb. Nat. Tijdschr. Ned. Ind. xxix. p. 142 (1867).

Psittacula melanogenys, Finsch, Die Papag. ii. p. 626 (1868).

Cyclopsittacus melanogenys, Salvad. Ann. Mus. Civ. Gen. x. p. 29, sp. 33 (1877).

[No. 207. Wokan. Female: eyes black; legs with a greenish tinge.

No. 208. Wokan. Probably a male; but the specimen was too much injured to determine.—*J. M.*]

The example, without indication of the sex, is most likely a female, having the ear-coverts orange.

6. Eclectus polychlorus (Scop.).

Psittacus polychlorus, Scop. Del. Flor. et Faun. Insubr. p. 87, n. 27 (1786) (ex Sonnerat), ♂.

Eclectus linnæi, Wagl. Mon. Psitt. p. 571, t. xxi. (1832), ♀.

Eclectus polychlorus, var. *aruensis*, G. R. Gr. P. Z. S. 1858, p. 183.

[1] The specimen in the Berlin Museum, which has been regarded as a second one of *M. alecto*, looks smaller than the New-Guinea specimens from having the primaries cut off.

Eclectus polychlorus, Salvad. Ann. Mus. Civ. Gen. x. p. 31. sp. 7 (1877).

[No. 212. Wokan. Male: eyes orange; upper mandible red towards the base, and whitish-yellow towards the tip; lower one jet-black; stomach contained inside-coating of cocoa-nut, and some species of comminuted red coral (tubular coral); feet black.—*J. M.*]

Mr. G. R. Gray considered the Aru specimens as forming a peculiar race of *E. polychlorus*, on account of the yellowish band at the tip of the tail being more conspicuous and tinged with reddish; but the differences are very slight and not constant.

7. CHALCOPSITTACUS SCINTILLATUS (Temm.).

Psittacus scintillatus, Temm. Pl. Col. p. 569 (1835), Lobo, juv. (type examined).

Chalcopsitta rubrifrons, G. R. Gr. P. Z. S. 1858, p. 182. pt. 135 (ad.), Aru (type examined).

Domicella scintillata, Finsch, Die Papag. ii. p. 752 (1868).

Chalcopsittacus scintillatus, Salvad. Ann. Mus. Civ. Gen. x. p. 34, sp. 75 (1877).

[No. 213. Wokan. Male: eyes dull red; feet black; both mandibles black; stomach quite empty.

No. 229. Wokan. Male: eyes orange; feet and bill black; stomach contained insects and leaves.—*J. M.*]

Both specimens are fully adult.

8. TRICHOGLOSSUS NIGRIGULARIS, G. R. Gr.

Trichoglossus nigrigularis, G. R. Gr. P. Z. S. 1858, p. 183, Aru (type examined).

Trichoglossus cyanogrammus, part., Finsch, Die Papag. ii. 830 (1868).

[No. 237. Male, Wokan: eyes red, bill red; legs slate-colour; stomach contained small seeds. Shot at Wokan.—*J. M.*]

This species *is confined to the Aru Islands and to the Ké Islands*, and it is quite distinct from *T. cyanogrammus* (Wagl.), with which it has been assimilated by Wallace, Schlegel, and Finsch.

I have seen many specimens of both species, and I have found that *constantly T. nigrigularis* differs from *T. cyanogrammus*:—

1st. In the red of the breast inclining to orange, paler and with a most conspicuous yellow tint near the dark edges of the feathers.

2nd. The dark edges of the breast-feathers are much narrower, as in *T. massenæ*.

3rd. The head above has only two colours, blue in the anterior half, greenish in the other half; while in *T. cyanogrammus* the head above has three colours, blue on the sinciput, green on the vertex, and purplish-brown on the occiput, like *T. massenæ*.

4th. The middle of the abdomen is generally blackish.

5th. The dimensions are larger.

The Ké-Islands specimens are a little larger than those from the Aru Islands.

9. Sauropatis chloris (Bodd.).

Halcyon sordida, var., G. R. Gr. P. Z. S. 1858, p. 172 (Aru).

[No. 244. Female, Dobbo: legs slate, with slightly bluish tinge; eyes black. Shot on Dobbo on the 20th September, 1874.—*J. M.*]

This bird has the upper parts very dark, and in that respect approaches *S. sordida* (Gould), to which Mr. Gray thought that the Aru birds should be referred; but I have seen other specimens from the Aru Islands with the upper parts of a much brighter colour, exactly like others from Amboyna, Bouru, and other localities.

The true *S. sordida* (Gould) is a much larger bird.

10. Sauropatis sancta (Vig. & Horsf.).

Halcyon sanctus, Sharpe, Mon. Alced. pl. 91 (1868–1871).

Sauropatis sancta, Salvad. Ann. Mus. Civ. Gen. x. p. 306, sp. 33 (1877).

[No. 219. Male (young), Wokan: eyes black; upper mandible and edge of lower black, under base of lower light-coloured; feet brown.—*J. M.*]

11. Sauromarptis gaudichaudi (Q. & G.).

Dacelo gaudichaudii, Quoy & Gaim. Voy. Uran. Zool. p. 112, pl. 25 (1824), Waigiou, Guebé (type examined); Sharpe, Mon. Alced. pl. 116 (1868–1871).

Sauromarptis gaudichaudi, Salvad. Ann. Mus. Civ. Gen. x. p. 306. sp. 35 (1877).

[203. Male; 204. Female, Wokan: eyes black; legs greenish, yellow tinge; stomach contained insects and portions of leaves.—*J. M.*]

The male has the tail blue; and the female has the tail chestnut.

12. Sauromarptis tyro (G. R. Gr.).

Dacelo tyro, G. R. Gr. P. Z. S. 1858, p. 171, pl. 133, Aru (type examined); Sharpe, Mon. Alced. pl. 117 (1868–1871).

Sauromarptis tyro, Salvad. Ann. Mus. Civ. Gen. x. p. 307. sp. 36 (1877).

[No. 205. Young male? Wokan: eyes black; legs greenish-yellow tinge; stomach contained insects and portions of leaves.—*J. M.*]

This bird differs from the adult in having the underparts entirely reddish, and in the blue of the wings inclining to greenish.

13. Ægotheles wallacei, G. R. Gr.

Ægotheles wallacei, G. R. Gr. P. Z. S. 1859, p. 154, Dorey, (type examined); Schleg. Ned. Tijdschr. Dierk. iii. p. 340 (1866), Aru; Salvad. Ann. Mus. Civ. Gen. x. p. 310. sp. 7 (1877).

Caprimulgus brachyurus, Rosenb. Nat. Tijdschr. Ned. Ind. xxix. p. 143 (1867), Aru (type examined).

[No. 259. Female, Wanumbai.—*J. M.*]

I have compared this specimen with the type in the British Mu-

seum and with two other specimens from New Guinea, collected by D'Albertis and Bruijn's men. From all these it differs in the finer vermiculations, and in the somewhat smaller dimensions, and perhaps may belong to a different species; but we must see some more specimens from the Aru Islands before we can decide the question.

The *Caprimulgus brachyurus*, Rosenb., is a young bird with the tail incompletely developed.

14. MACROPTERYX MYSTACEA (Less.).

[No. 254. Male, Wanumbai: eyes black.—*J. M.*]

This bird has a brown spot on the ear-coverts.

15. HIRUNDO JAVANICA, Sparrm.

Hirundo frontalis, Quoy & Gaim. Voy. Astrol. Zool. i. p. 204, pl. 12. f. 1 (1830), Dorey (type examined).

[No. 225. Female, Dobbo: eyes black.—*J. M.*]

16. HYLOCHELIDON NIGRICANS (Vieill.).

Hirundo nigricans, Vieill. N. D. xiv. p. 523 (1817), New Holland (type examined).

[No. 226. Male, Dobbo: eyes black. Shot by the Professor at the village of Dobbo.—*J. M.*]

17. MACHÆRORHYNCHUS XANTHOGENYS, G. R. Gr.

Machærirhynchus xanthogenys, G. R. Gr. P. Z. S. 1858, p. 176, Aru (type examined); Salvad. Atti R. Acc. Sc. Tor. x. p. 375. sp. 2 (1875).

[No. 234. Male, Wokan: eyes and bill black; feet slate. Shot at Wokan.—*J. M.*]

18. GRAUCALUS MELANOPS (Lath.).

Campephaga melanops, var., G. R. Gr. P. Z. S. 1861, p. 435.

[No. 228. Female, Dobbo: eyes brown; stomach contained insects; legs and bill black. Shot by the Professor at the village of Dobbo.—*J. M.*]

The specimen agrees entirely with *black-faced* Australian males, and with male birds collected by Signor D'Albertis at Yule Island (Ann. Mus. Civ. Gen. vii. (1875), p. 820. sp. 41).

19. EDOLIOSOMA MUELLERI, Salvad.

Ceblepyris plumbea, part., S. Müll. (nec Wagl.), Verh. Land- en Volkenk. p. 189 (1839–1844), New Guinea only (type examined).

Edoliosoma mülleri, Salvad. Ann. Mus. Civ. Gen. vii. p. 928 (1875).

[No. 260, Wanumbai: male. No. 245. Female: eyes hazel; bill black; legs dark with brownish tinge; stomach had insects. Shot on 20th, Dobbo.—*J. M.*]

These specimens agree in every respect with New-Guinea specimens. *Edoliosoma tenuirostre* (Jard. et Selby), from Australia, is scarcely different from the New-Guinea bird; perhaps it is a little larger.

S. Müller, under the name of *Ceblepyris plumbea*, has united a specimen from Utanata and a young bird from Timor; but this, according to me, belongs to a much lighter species, not yet named, of which I have seen adult specimens in the British Museum. With the same name of *C. plumbea* there is in the Leyden Museum a specimen marked "Borneo:" it is a young bird exactly like that from Timor; and I think that the locality is wrong. On the evidence of this specimen Hartlaub (Journ. f. Orn. 1865, p. 155) has asserted the existence of *C. plumbea*, Müll., in Borneo.

20. Dicruropsis assimilis (G. R. Gr.).

Dicrurus assimilis, G. R. Gr. P. Z. S. 1858, p. 129, Aru (type examined).

Chibia assimilis, Sharpe, Cat. B. Brit. Mus. iii. p. 239 (1877).

[No. 214. Female, Wokan: eyes dull red; feet and bill black; stomach contained insects.—*J. M.*]

21. Colluricincla megarhyncha (Q. & G.).

Muscicapa megarhyncha, Quoy & Gaim. Voy. Astrol. Zool. i. p. 172, pl. 3. f. 1 (1830), Dorey (type examined).

Napothera elæoides, Müll., Mus. Lugd. (type examined).

Myiolestes aruënsis, G. R. Gr. P. Z. S. 1858, p. 180, Aru (type examined).

Pinarolestes megarhynchus, Sharpe, Cat. B. Brit. Mus. iii. p. 295 (1877).

[No. 240. Male: eyes hazel; legs slate. Shot at Wanumbai.—*J. M.*]

I quite agree with Mr. Sharpe in uniting the Aru bird with the New-Guinea one.

22. Rectes aruënsis, Sharpe.

Rectes dichrous, G. R. Gr. (nec Bp.), P. Z. S. 1858, p. 179, Aru.

Rectes aruënsis, Sharpe, Cat. B. Brit. Mus. iii. p. 285 (1877), Aru (type examined)[1].

[No. 238. Female, Wanumbai: eyes dull red; feet slate-colour with a violet tinge; stomach contained land-shells and remains of insects.—*J. M.*]

255. Female, Wanumbai: eyes hazel.—*J. M.*]

These specimens, both marked females, and a female collected by Beccari in the Aru Islands, agree in having the head blackish, the front neck blackish tinged with reddish brown, the uropygium and the upper tail-coverts blackish brown, the tail blackish above, and decidedly reddish brown underneath. These three specimens, all

[1] The type of *Rectes dichrous ceramensis*, Meyer (Sitzb. Ak. Wien, lxix. p. 208), which I have lately seen in the Museum of Vienna, is a specimen of *R. uropygialis*, Gray, and not of *R. aruënsis*, as Mr. Sharpe suspects. The locality, Ceram, is, no doubt, wrong. *Rectes draschi*, Pelzeln, Verh. z.-b. Gesell. Wien, 1876, p. 218, is a female of *Edoliosoma schisticeps*, G. R. Gr. (ex Hombr. & Jacq. Voy. Pôle Sud, Atlas, Zool. pl. 10. f. 1, ♀).

marked females, differ from two other specimens collected by Beccari, marked males. These have the head, the neck, the tail, and the upper tail-coverts jet-black; and the breast in one specimen is tinged with black more conspicuously than in the others. Ought we to believe that the plumage of the first three specimens, described by Sharpe as that of the young bird, is also the plumage of the adult female, or that by a strange combination all the three specimens marked females are really young ones?

23. Cracticus cassicus (Bodd.).

[No. 218. Female, Wokan: eyes dark, deep blue; base of the mandibles light-coloured, with a tinge of blue, tips of mandibles black; stomach with leaves and seeds.—*J. M.*]

24. Cyrtostomus frenatus (S. Müll.).

[No. 222. Male, Wokan: eyes black; bill and feet black.—*J. M.*]

25. Myzomela nigrita, G. R. Gr.

Myzomela nigrita, G. R. Gr. P. Z. S. 1858, p. 173, Aru (type examined).

Myzomela erythrocephala, Meyer (nec Gould), Sitzb. k. Ak. Wiss. zu Wien, lxx. p. 204 (1874), ♀ and young ♂ (specimens examined).

[No. 232. Wokan, male: eyes hazel; bill and feet black; stomach had insects.—*J. M.*]

Gray describes the male as "entirely shining deep black," omitting to mention that it has the under wing-coverts and the inner edges of the remiges white.

26. Xanthotis filigera (Gould).

Ptilotis filigera, Gould, P. Z. S. 1850, p. 278, pl. 34, Cape York.

[No. 261. Wanumbai, male.—*J. M.*]

This bird has the light spots on the nape scarcely visible. Two specimens from Utanata, collected by S. Müller, in the Museum of Leyden, belong to this species and not to the northern form *X. chrysotis* (Less.).

27. Drymaœdus beccarii, Salvad.

Drymaœdus beccarii, Salvad. Ann. Mus. Civ. Gen. vii. p. 965. sp. 52 (1875), Arfak.

[No. 257. Wanumbai, male.—*J. M.*]

This example agrees completely with the type from the Arfak Mountains. This is a new species for the Aru Islands.

28. Calornis metallica (Temm.).

[Nos. 215, 216, 217. Males, Wokan: eyes coral-red; bill and legs black; small black seeds in the stomach of the adult males. The above were the most abundant birds we saw on the 17th September 1874.—*J. M.*]

29. Mino dumonti, Less.

[No. 250. Wanumbai, male: eyes yellow. No. 233. Wanumbai, female: eyes yellow; legs and bill yellow; stomach contained seeds. —*J. M.*]

30. Paradisea apoda, Linn.

[Nos. 248, 249. Males: eyes yellow. No. 247. Female: eyes brown. No. 202. Young male: eyes pale yellow; legs light fawn-colour; the stomach was empty. This bird was shot by Mr. Abbot; he saw two others at the same time, but noticed none of them with plumes. The Professor and Captain Nares saw a large flock; and, again, none of them were noticed with plumes. No other specimens were seen by the party. No. 246. Female: eyes brown.—*J. M.*]

Four specimens from Wanumbai, and one from Wokan.

1st. An adult "male" (No. 249), but not in full dress, wanting the long yellow feathers on the sides.

2nd. A "male" (No. 248) not fully adult, having the two middle tail-feathers with very large webs, like the lateral ones, and longer than these, one about two inches, the other only one inch; they are of a lanceolate shape.

3rd. An adult "female" (No. 247) with yellowish nape.

4th. A young "male" from Wokan (No. 202).

5th. A young "female" (No. 246). The two last are exactly alike in colour; but the male is larger than the female. Both have no yellow on the nape.

31. Cicinnurus regius (Linn.).

Cicinnurus regius, Salvad. Ann. Mus. Civ. Gen. ix. p. 192. sp. 24 (1876); Sharpe, Cat. B. Brit. Mus. iii. p. 171 (1877).

[No. 201. Male: eyes dull red; legs a delicate sky-blue; the stomach contained a few remains of insects. This bird was shot by Mr. Abbot; two others were in company with it at the time. These were the only specimens seen, either by Mr. Abbot or any other of the party. They were not apparently very shy. A gun is said to have been fired, close by, just before they were observed. No. 241. Male, shot at Wokan: eyes dull red; legs delicate sky-blue or cobalt blue. Nos. 242, 243. Males, shot at Wanumbai. Nos. 250, 251. Males: eyes yellow. No. 252. Male (young): eyes yellow.—*J. M.*]

Seven specimens—one fully adult "male" (No. 201) from Wokan, and five adult "males" (Nos. 241, 242, 243, 250, 251), and a young "male" (No. 252) from Wanumbai.

32. Manucodia atra (Less.).

Manucodia atra, Salvad. Ann. Mus. Civ. Gen. ix. p. 189. sp. 4 (1876); Sharpe, Cat. B. Brit. Mus. iii. p. 183 (1877).

[Nos. 209, 210. Male, female: eyes orange; legs black; the stomach contained fruit and seeds.—*J. M.*]

The male is larger than the female.

33. ÆLURŒDUS MELANOTIS (G. R. Gr.).

Ptilonorhynchus melanotis, G. R. Gr. P. Z. S. 1858, p. 181, Aru, (type examined).

Ælurœdus melanotis, Gould, B. of New Guinea, pt. i. (1875); Salvad. Ann. Mus. Civ. Gen. ix. p. 193, sp. 28 (1877).

[No. 211. Eyes red; legs with a bluish tinge. Appears to be a young bird; could not make out the sex.—*J. M.*]

Mr. Gould has expressed some doubts about *Æ. arfakianus*, Meyer, being really different from this species; but the greater amount of black on the head and on the neck of *Æ. arfakianus*, the triangular shape of the light spots, with the acute angle turning downwards, on the upper part of the breast, and the smaller dimensions, distinguish at once the New-Guinea bird from its Aruan relative.

34. PTILOPUS IOZONUS, G. R. Gr.

Ptilonopus (!) *iozonus*, G. R. Gr. P. Z. S. 1858, p. 186, Aru (type examined).

Ptilopus ionozonus, Salvad. Ann. Mus. Civ. Gen. ix. p. 198. sp. 24 (1876).

[No. 289. Wanumbai, female: legs red; base of upper mandible red, tip yellow; lower green, with the tip lighter; stomach empty. —*J. M.*]

35. PTILOPUS CORONULATUS, G. R. Gr.

Ptilonopus coronulatus, G. R. Gr. P. Z. S. 1858, p. 185, pl. 138, Aru (type examined).

Ptilopus coronulatus, Salvad. Ann. Mus. Civ. Gen. ix. p. 198. sp. 26 (1876).

[Nos. 220, 221. Wokan, males: eyes red; bill green; feet red (dull); stomach empty.—*J. M.*]

36. CARPOPHAGA ZOËÆ (Less.).

Columba zoëæ, Less. Voy. Coq. Zool. Atlas, pl. 39 (1826), i. pt. 2, p. 705 (1828), Dorey (type examined).

Carpophaga zoëæ, Salvad. Ann. Mus. Civ. Gen. ix. p. 201. sp. 47 (1876).

[No. 236. Wanumbai, male: eyes white; legs red; beak black; stomach contained seeds. Shot at Wanumbai.—*J. M.*]

37. MACROPYGIA DOREYA, Bp.

Macropygia doreya, Bp. Consp. ii. p. 57 (1854), New Guinea (type examined); Salvad. Ann. Mus. Civ. Gen. ix. p. 204. sp. 65 (1876).

Macropygia phasianella, part., G. R. Gr. (nec Temm.), P. Z. S. 1858, p. 187, Aru Islands only; Wall. Ibis, 1865, p. 389. sp. 81 (partim).

[No. 254. Wokan, female.—*J. M.*]

38. MEGAPODIUS DUPERREYI, Less. & Garn.

Megapodius duperreyi, Less. & Garn. Bull. Sc. Nat. viii. p. 113 (1826), Dorey (type examined); Less. Voy. Coq. Zool. i. pt. 2, p. 700, 703, pl. 36 (1826–1828).

Megapode reinwardt, Temm. Pl. Col. livr. 37, genre *Megapode* (1823).

Megapodius rubripes, Temm. Pl. Col. 411 (25th October 1826[1]), Celebes! Amboyna!

Megapodius reinwardtii (sic), Temm. apud Wagl. Syst. Av. Gen. *Megapodius*, note (1827), descr. nulla.

Megapodius reinwardtii, Wagl. Syst. Av. Gen. *Megapodius*, Additamenta, sp. 4 (1827).

Megapodius rufipes, S. Müll., Verh. Land- en Volkenk. pp. 23, 109 (1839–1844), Utanata.

Megapodius, sp., Wall. Ann. & Mag. Nat. Hist. (2) xx. pp. 473, 477 (1857), Ké, Aru.

[No. 230. Female: eyes dull red; legs orange; bill horn-colour. —*J. M.*]

A female (No. 230) from Wokan.

39. NUMENIUS UROPYGIALIS, Gould.

[No. 258. Wanumbai, male.—*J. M.*]

40. TRINGOIDES HYPOLEUCUS (Linn.).

[No. 227. Dobbo, female: legs light green; bill dark green; eyes hazel; stomach contained insects.—*J. M.*]

7. On the Systematic Position of the Momotidæ. By A. H. GARROD, M.A., F.R.S., Prosector to the Society.

[Received December 3, 1877.]

In my paper on certain muscles of birds and their value in classification[2], I have made an error, which I desire to correct, with reference to the systematic position of the Momotidæ. I there included them with the Coraciidæ as part of a single family, characterized among the Anomalogonatæ by the possession of a nude oil-gland, together with colic cæca. Since the time my paper appeared, I have had the opportunity of dissecting several species of Momotidæ, thanks to the kindness of Mr. O. Salvin, including *Momotus lessoni*, *M. æquatorialis*, *M. brasiliensis* (a specimen which had lived in the Society's Gardens), *Hylomanes gularis*, and *Eumomota superciliaris*; and I find that in none of these are colic cæca present.

Further, in *Hylomanes gularis* and *Eumomota superciliaris* I find

[1] I doubt whether this date, given by Crotch (Ibis, 1868, p. 500), for the publication of the 69th livraison of Temminck's 'Planches Coloriées,' is exact; my doubts rise from the fact that *M. rubripes* is not mentioned by Wagler in his 'Systema Avium,' published in 1827.

[2] P. Z. S. 1874, p. 123.

a minute tuft on the apex of the oil-gland, although in the several species of *Momotus* there is no trace of any tuft; in fact they have lost it, evidently since the family was differentiated off.

Such being the case, the Momotidæ must be placed with the Piciformes, as defined by me, instead of with the Passeriformes; and the amended arrangement may be thus tabulated, the Todidæ and Momotidæ almost certainly forming a single family, as has been suggested by many, and which is confirmed by the observation made by Dr. Murie that in the Todidæ the beak is serrate[1].

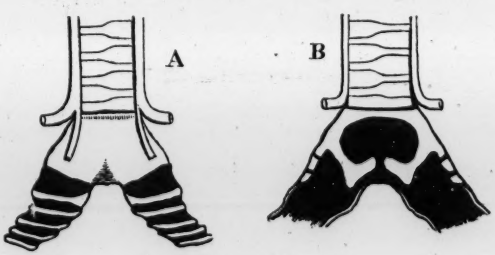
ANOMALOGONATÆ.

Aves Piciformes.	*Aves Passeriformes.*
Bucerotidæ.	Coraciidæ.
Alcedinidæ.	Steatornithidæ.
Momotidæ.	Caprimulgidæ.
Todidæ.	Galbulidæ.
Ramphastidæ.	Meropidæ.
Capitonidæ.	Trogonidæ.
Pici.	Bucconidæ (?).
	Passeres.

In further favour of the inclusion of the Momotidæ with the Piciformes may be mentioned the pterylographic peculiarity found in them all, namely that the outer pectoral branch of the inferior tract is separated almost entirely from the inner branch, with which it blends for nearly its whole distance, or entirely, in the Passeriformes.

From a skin, I have been able to determine that the deep flexor tendons of the leg of *Todus viridis* are arranged on exactly the same plan in it as in the Momotidæ[2], and that its tensor patagii brevis also terminates in exactly the same manner as it does in them[3].

The syrinx of the Momotidæ has never been fully described, so far as I am aware. I therefore exhibit a figure of it as it appears in



Syrinx of *Momotus lessoni*.

Momotus lessoni, which resembles that of the other species which I have examined. Fig. A is the anterior view; B, the posterior.

[1] P. Z. S. 1872, p. 671.
[2] *Vide* P. Z. S. 1875, p. 344.
[3] *Vide* P. Z. S. 1876, p. 511.

The large cartilaginous three-way piece, in which the trachea terminates inferiorly, is compound, being formed of several fixed rings. It is complete in front, being represented behind by a hooked process on either side, extending inwards towards the middle line, where the two nearly meet. The lateral muscles of the trachea extend down to the upper margin of this peculiar syrinx; and a few of their anterior fibres continue onwards to the surface of the cartilaginous box, where they terminate, sometimes higher and sometimes lower, but always before reaching its inferior margin.

8. Note on the Gizzard and other Organs of *Carpophaga latrans*. By A. H. Garrod, M.A., F.R.S., Prosector to the Society.

[Received December 3, 1877.]

In the collection of birds preserved in spirit by H.M.S. 'Challenger' is the body, after the skin had been removed, of a single specimen of *Carpophaga latrans*, together with the gizzard of a second individual of the same species, obtained at Kandavu, Fiji. These form the material for the present communication.

In his note-book Mr. John Murrray makes the following remarks on the species[1]:—"Stomach contained the fruit of some tree unknown to me. The coat of the stomach had hard papilla-like ossifications of a circular form, two or three rows. . . . These indurations are composed of a horny substance"—from which it is seen that Mr. Murray was the first to recognize the existence of the strange arrangement to be here described.

The thin-walled and capacious crop contained only one thing in its interior—a complete fruit, which has been identified for me by Mr. W. T. Thiselton Dyer, as that of *Oncocarpus vitiensis*. In the gizzard was also found a portion of a second example of the same fruit.

Oncocarpus vitiensis is a tree belonging to the natural order Anacardiaceæ, which, according to Dr. Seemann[2], is "about sixty feet high, bearing large oblong leaves and a very curious corky fruit, somewhat resembling the seed of a walnut." The tree is included among those which are poisonous by the Fijians; and its sap produces an intense itching of the skin, when brought into contact with it, whence the native name Kau Karo or itch-wood.

For the crushing of this very hard fruit a special anatomical modification of the gizzard-walls of this Fruit-pigeon is developed, which is peculiarly interesting and tends to prove the plasticity of organs when aberrant forces come into play.

The gizzard is not developed to any thing like the extent that it is

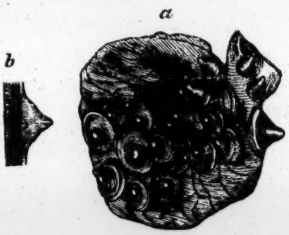
[1] *Vide* P. Z. S. 1877, p. 737.
[2] Seeman's Mission to Viti, p. 334.

in the Gallinæ or Anseres, but, as in most Carpophagine birds, is small, and has its muscular walls comparativaly ill-developed. No stones of any kind were found in it.

It is the epithelial lining which is so peculiar in *Carpophaga latrans*. Instead of being smooth, or folded into plications, as is usually the case, its surface is raised into horny cones which closely resemble in appearance the tubercles for the attachment of the spines of the Echinoderm genus *Cidaris*. In fig. 1, *a*, the interior of the gizzard is represented; fig. 1, *b*, is a section of one of the cones resting upon the muscular gizzard-wall.

These conical processes are corneous throughout, are erect, and are quite transparent when cut into sections. There are twenty-

Fig. 1.



Interior of the gizzard of *Carpophaga latrans*.

three of them, large and small, in each of my specimens. The larger cones, which are the more numerous, average seven millimetres in diameter at their bases, their axial length being about four millimetres; the smallest cone is four millimetres across and of nearly the same height.

The cones are arranged, close to one another, in a fairly regular manner upon the two muscle-masses, being distributed in rows of three, counting either transversely or longitudinally. This disposes of eighteen of the twenty-three cones. The remaining five are found on the tendinous intermuscular walls of the organ, in longitudinal rows, two in one row, three in the other.

A section of any one of the cones demonstrates that it is not in the least ossified, but corneous throughout, and of about the density of ox-horn. It is also seen that the attached surface of the epithelium does not participate in the undulations of the free surface, being quite smooth. Neither does it send any processes into the cones. Between the cones the epithelium is yielding, and only semicorneous.

A still further exaggeration of this abnormal condition of the epithelium of the gizzard of *Carpophaga latrans* has been described

by MM. Jules Verreaux and O. Des Murs in *Phænorhina goliath*[1] of New Caledonia, which "se nourrit de graines de *semicarpum*." In this bird "le gésier, déjà on ne peut plus musculeux par lui-même, a sa surface intérieure régulièrement recouverte . . . de pointes véritablement osseuses, rappelant la forme de celles qui se voient à la surface du corps de la *Raia* bouclée, ou *Clavel*, ou *Clavelade*. Ces pointes, en cône aplati, ont leur base plane de 5 millim. de diamètre, d'une hauteur de 5 à 6 mill., sont légèrement inclinées sur elles-mêmes, et quelquefois recourbées par la dessication, l'extrémité en étant mousse." A central fibrous peduncle is also said to run through each osseous element.

Phænorhina goliath, from what has been said above, therefore differs from *Carpophaga latrans* in having the cones of the gizzard proportionally longer, at the same time that they are ossified (which necessitates the presence of vessels in the ossification, which appear after death as the fibrous cord) and oblique. There is, however, a great similarity between the two organs.

I am informed by the Rev. S. J. Whitmee that *Carpophaga pacifica* in the Samoan Islands feeds on nutmegs, from which it is highly probable that in that species the gizzard-epithelium is modified in a manner similar to that of the Fiji or New Caledonian species. Specimens of *C. pacifica* preserved would therefore be of special interest for the determination of this point.

Fig. 2.



Syrinx of *Carpophaga latrans*.

With reference to the other parts of *Carpophaga latrans*, the intestine is very capacious, only nine inches long, and transversely sacculated from the contraction of its outer longitudinal muscular coat, this producing the appearance of thirty bold transverse folds on the mucous surface. There are no colic cæca; and, as in the genus *Carpophaga* generally[2], the gall-bladder is well developed. The liver-lobes are equal in size.

[1] Revue et Magasin de Zoologie, 1862, p. 168. [2] *Vide* P. Z. S. 1874, p. 258.

The syrinx (fig. 2, p. 104) is Columbine, with its lateral muscles attached inferiorly to the membrane between the penultimate and antepenultimate tracheal rings. The trachea is composed of rings which are very yielding in the middle line posteriorly. As can be seen in the figure, the musculi sterno-tracheales, which are independent of the intrinsic muscles, are not quite symmetrically attached.

The furcula, as is the rule in the subfamily, is very slender, but complete, wherein this species differs from *Phænorhina goliath*, in which it is cartilaginous at its symphysial end, according to MM. Verreaux and Des Murs[1].

Myologically, the ambiens is to be found, not large; the femorocaudal with its accessory head are well developed; the semitendinosus and its accessorius are the same.

There are two carotids; so that in this as well as all the other features above mentioned *Carpophaga latrans* agrees with my definition of the division of the Columbidæ into which it naturally falls, its gizzard differing, however, from that of all but one of the species which have been examined.

9. Description of a new Species of *Helix* from Japan. By Edgar A. Smith, F.Z.S.

[Received December 4, 1877.]

Helix (Camena) congener, n. sp.

Testa convexiusculo-orbiculata, spira breviter conica, subaperte umbilicata, tenuis, sordide pallido-virescenti-albida, fasciis tribus nigrofuscis, media latissima, infima umbilicum pingente; anfractus 5½, convexiusculi, lineis incrementi obliquis flexuosis, striisque spiralibus confertis insculpti, ultimus subtus satis convexus, prope aperturam leviter breviterque descendens; apertura perobliqua, semilunaris, intus fasciata; peristoma tenue, rosaceum vel liliaceum, marginibus conniventibus, supero breviter expanso, basali et columellari latius reflexis.

Diam. max. 30 mill., min. 25, alt. 18; aperturæ long. 15, lat. 14.

As this form approaches very closely to *H. peliomphala* of Pfeiffer, I will give a comparative description as the best means of showing its distinctness.

It is uniformly smaller, more narrowly umbilicated and of a paler ground-colour; its spire is constantly more elevated, aperture smaller; the banding in the fourteen specimens examined invariably follows the same arrangement, and not one of them exhibits any trace of the opaque yellow stripes or blotches which are almost invariably observable in a greater or less degree (on the bands most conspicuously) in *H. peliomphala*.

This is a very pretty, delicate species, and of a thin semitransparent texture. On the front of body-whorl, about two thirds of its whole extent from the lip, there is an obliqne strongly marked line which is

[1] *Loc. cit.* p. 140.

suffused with a pinkish tint, evidently marking a period of cessation of growth, the colour having stained that part of the shell which then formed the lip of the aperture.

The uppermost dark band of the last whorl is situated a little above the middle, and passes just above the suture, and can be traced in part almost to the apical whorl. Adjoining this thin line there is a second thread-like one which borders the sutural edge of the whorls. The median band is very broad, frequently more than twice as wide as that above it, and encircles the whorl somewhat below the periphery; and the basal one, equally broad with the preceding, winds around the rounded margin of the umbilicus.



Helix (*Camena*) *congener*.

Other allied forms of this species are *H. luhuana*, Sowerby, which seems to be distinct from *H. peliomphala*, *H. simodæ*, Jay, and *H. herklotsi*, Martens.

Whether these five are good and distinct species or only local forms of one and the same, of which intermediate gradations have not yet been observed, remains yet to be ascertained; but, so far as our present knowledge extends, the differences of form, texture, banding, &c., warrant the presumption that they are specifically distinct.

The series of specimens upon which the above description is based has been kindly placed in my hands for examination by Mr. G. B. Sowerby, junior, who has presented two of them to the national collection.

10. Contributions to the Ornithology of the Philippines.—No. IV. On the Collection made by Mr. A. H. Everett in the Islands of Dinagat, Bazol, Nipah, and Sakuyok.

By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received December 11, 1877.]

(Plates VI.–VIII.)

The four islands in which Mr. Everett collected the birds of which I propose to give an account are situated to the north of the



Smit. lith

Hanhart imp.

CEYX ARGENTATA.



J.Gould lith. H.C.Richter imp.

1 HYPOTHYMIS CŒLESTIS.
2 MIXORNIS CAPITALIS.



J. Smit, del.

Hanhart, imp.

1. DICÆUM SCHISTACEUM.
2. DICÆUM EVERETTI.
3. PRIONOCHILUS OLIVACEUS.

shores of Mindanao, and are only separated from that island by narrow channels. Through these channels the wind blows with considerable force throughout the greater part of the year, being either the gales of the S.W. or the N.E. monsoon.

Mr. Everett's observations on the ornithological features of these islands, coming as they do from a personal observer, merit transcription. He writes:—"No district visited so far has equalled the vicinity of Manilla in the number and variety of its birds. The progress of the work shows that a very close general similarity exists between the islands of Mindanao and Luzon, though there are some marked local differences. This was to be expected; and it is rather surprising that the differences are as marked as they are, when we consider that not only are the islands separated from another by very narrow spaces of sea, but that they are situated in an area where strong winds blow in various directions, with little cessation during the major part of the year, accompanied with violent squalls and typhoons, so that any high degree of specialization in the local avifauna would seem, *à priori*, out of the question."

In the island of Dinagat, Mr. Everett writes, he found birds to be excessively rare; still he obtained 39 species, 7 of which were undescribed:—

Ceyx argentata.
Hypothymis cœlestis.
Mixornis capitalis.
Dicæum schistaceum.
Dicæum everetti.
Prionochilus olivaceus.
Æthopyga dubia.

Only 13 species were obtained in the small islands of Nipah, Bazol, and Sakuyok; and they are all known inhabitants of Mindanao.

1. Cacatua hæmaturopygia (1).

[Nipah, ♀, July.]

2. Loriculus hartlaubi (7).

[*a*. Dinagat, ♂, ♀, June. *b*. Bazol, ♂, July.]

The example figured, P. Z. S. 1877, p. 819 (♂), is in full adult plumage, the occipital feathers being orange-red, grading into orange on the nape, which colour suffuses and descends the back, losing itself in the pure green of the lower back. There is no blue about the face, chin, or throat; the dark blue of the under surface of the rectrices fades into pale blue at their apices. The orange hue on the back of the female figured is less intense.

3. Harpactes ardens (34).

[Dinagat, ♂, June. Iris brown; bill yellow, base green.]

A single example, in adult plumage, and which has a more massive bill than is found in Luzon individuals. Otherwise alike, and dimensions equal.

4. Merops philippinus (35).

[Bazol, ♂, July.]

5. Eurystomus orientalis (37).

[*a*. Dinagat, ♂, June. *b*. Nipah, ♀, July.]

6. Pelargopsis gigantea.

Pelargopsis gigantea, Walden, Ann. & Mag. Nat. Hist. (4) xiii. p. 123, P. Z. S. 1877, pp. 541, 822.

[Dinagat, ♀, ♂, June.]

Neither example in full plumage; and both are not separable from the Butuan male observed upon *l. c.* Butuan, Pasananca, Malanipa, and these Dinagat individuals appear to belong to a small race of *P. gigantea*.

7. Ceyx argentata. (Plate VI.)

Ceyx argentata, Tweeddale, Ann. & Mag. Nat. Hist. (4) xx. p. 533, ♀ (1 December 1877).

[Dinagat, ♀, June. Iris brown; bill black; feet pale reddish.]

♀. Chin, throat, upper breast, abdomen, ventral region, major under wing-coverts, and thigh-coverts pure white. Cheeks, sides of head, and ear-coverts black. Lower breast and flanks black, washed with deep blue. Rectrices and under tail-coverts black. Plumage above black; a bold supercilium commencing above the eye and running into the occipital crest, formed by the component plumes being tipped with pale silvery blue; many of the feathers of the vertex minutely tipped with silvery blue. Occipital crest tipped with pale silvery bluish green, or silvery blue, or the two together. Dorsal plumage and lengthened upper tail-coverts black at base, then silvery bluish green, then pale silvery blue. Wings black. Major coverts each with a terminal silvery-green spot. Loral spot white; an isolated tuft on the sides of neck, white tipped with creamy fulvous. Bill black.

Wing 2·62 inches, tail 1·37, tarsus 0·45, culmen 1·50.

8. Sauropatis chloris (47).

[Dinagat, ♀, June.]

9. Pyrrhocentor melanops (65).

[Nipah, ♀, July.]

10. Penelopides affinis.

Penelopides affinis, Tweeddale, Ann. & Mag. Nat. Hist. (4) xx. p. 534; P. Z. S. 1877, p. 824.

[Dinagat, ♂, June: iris crimson. *a*. ♀, June: iris rather dark brown-orange.]

11. Graucalus striatus (74).

[Nipah, ♂, ♀, July: iris Naples-yellow.]

12. Lalage dominica (76).

[Dinagat, ♂, ♀, June.]

13. Hyloterpe philippinensis (78).

[Dinagat, ♂, June; *b.* ♀: iris dark brown; bill black; legs bluish grey.]

Sexes alike—not to be distinguished from the type.

14. Dicrurus striatus.

Dicrurus striatus, Tweeddale, P. Z. S. 1877, p. 545, no. 20.

[Nipah, ♂, July.]

15. Leucocerca nigritorquis (83).

[Dinagat, ♀, June.]

16. Cyornis philippinensis.

Cyornis philippinensis, Sharpe, Tr. Linn. Soc. ser. 2, Zool. i. p. 325, "Panay" (1876).

[Dinagat, ♂, June.]

A single example, hardly separable from Zebu individuals, and agreeing with them in dimensions, consequently larger than Luzon and North-Mindanao specimens. Wing 3·66 inches, as against 2·95; tail, 3·00, as against 2·75.

17. Hypothymis cœlestis. (Plate VII. fig. 1.)

Hypothymis cœlestis, Tweeddale, Ann. & Mag. Nat. Hist. (4) xx. p. 536, ♀ (1 Dec. 1877).

[Dinagat, ♀, June: iris dark-brown; bill blue tipped and margined black; interior of gape yellow-green; orbital ring light green; legs grey blue.]

♀. Azure. Feathers of the head grey at their insertion, and each tipped with glistening azure; a lengthened occipital crest similarly marked. Space before the eye and lores pale blue. Chin, cheeks, throat, sides of neck, and upper breast rich velvety turquoise-blue, darker than the blues of the rest of the plumage. Back and upper tail-coverts with grey bases to the feathers, the extremities being blue, which is paler on the upper tail-coverts. Wing-coverts of the same shade of blue as the head. Quills dark brown externally, margined with a paler shade of blue. Lower breast, abdomen, vent, flanks, and under tail-coverts white, tinged with pale greenish blue, most intense on the flanks. Axillaries grey, tinged with pale blue. Rectrices above like the quills; underneath dark brown like under surface of the quills. Shafts of the rectrices brown above, almost white underneath. Shoulder-edge blue.

Wing 2·82 inches, tail 3·00, tarsus 0·62, culmen 0·56.

A form nearly allied to *H. azurea*, but differing in its lengthened crest, its paler tints of blue, and in the absence of any black markings. The blue shade of the throat and upper breast is about equal in tint to that of the predominant colour of the older known species.

18. Hirundo javanica.

Hirundo javanica, Sparrm., Mus. Carls. fasc. iv. t. 100 (1789).

[Dinagat, ♂, June.]

19. Sarcophanops steerii.

Eurylæmus steerii, Sharpe, 'Nature,' vol. xiv. p. 297. "Basilan."

Sarcophanops steerii, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 344, t. liv.

[Dinagat, ♀, June: iris brilliant sap-green; bill, orbital skin, and legs fine blue, paler on the tarsal scales; nails light grey.]

20. Broderipus acrorhynchus (90).

[Dinagat, ♂, June.]

21. Mixornis capitalis. (Plate VII. fig. 2.)

Mixornis capitalis, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 535 (Dec. 1, 1877).

[Dinagat, ♀, June: iris orange; bill blackish grey; legs greenish lead-grey; soles and nails ochreous yellow.]

♀. Forehead, vertex, and occiput rufous, each feather with a pale fulvous central streak. Space before the eyes and lores dull grey. Cheeks, ear-coverts, and sides of neck ashy, each feather with a pale albescent central streak. Nape, back, and wing-coverts the same, the pale striations on the back being very prominent in consequence of the abnormal length of the dorsal plumage. Uropygium and upper tail-coverts olive rusty grey and unstriated. Rectrices brown; outer pair with the whole outer and apical third of the inner web pale yellowish white; remaining pairs, middle excepted, broadly tipped on both webs with white, middle pairs slightly tipped with white. All the quills brown, narrowly margined externally with fulvous grey, the tertiaries with pale rusty. Basal portion of quills margined on their inner webs with white. Chin and throat rufous and rufous-white. Breast, under wing-coverts, abdomen, vent, and under tail-coverts white, faintly tinged with very pale yellow.

Wing 2·75 inches, tail 2·50, tarsus 0·70, culmen 0·62.

22. Macronus striaticeps.

Macronus striaticeps, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 331, "Basilan" (1876).

[Dinagat, ♀: iris white.]

The type specimen is not quite so rufous below, otherwise identical.

23. Ixus goiavier (99).

[Nipah, ♀, pairing, July.]

24. Poliolophus urostictus (101).

[Dinagat, ♂, June: orbital ring lemon-yellow. *b*, ♀, June.]

Sexes alike.

25. Criniger everetti.

Criniger everetti, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 535, et P. Z. S. 1877, p. 827, pl. lxxxiv.

[Dinagat, ♂, ♀, June.]

26. Orthotomus frontalis.

Orthotomus frontalis, Sharpe, Ibis, 1877, p. 112, t. ii. f. i.; Tr. L. S. (2) Zool. i. p. p. 336.

[Dinagat, ♂, ♀, June.]

27. Zosterops everetti.

Zosterops everetti, Tweeddale, P. Z. S. 1877, pp. 762, 829.

[Dinagat, ♂, June: iris yellowish brown; bill blackish; legs pale grey. *b*, ♀, June.]

Dinagat, North-Mindanao, and Zebu birds do not differ.

28. Dicæum rubriventer (120 *partim*).

Dicæum rubriventer, Lesson, Tr. p. 303; Tweeddale, P. Z. S. 1877, p. 763.

[Dinagat, ♂, June.]

The Dinagat birds in no respect differ from Luzon, Zebu and North-Mindanao examples.

29. Dicæum schistaceum. (Plate VIII. fig. 1.)

Dicæum schistaceum, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 537 (December 1, 1877).

[Dinagat, ♂, June.]

♂. Above fuliginous ashy; below ashy white. Remiges and rectrices above dark ashy brown, underneath paler. Under wing-coverts and axillaries pure white. Base of mandible (in dry specimens) yellowish white. Apex and the maxilla pale ruddy brown.

Wing 2·25 inches, tail 1·37, tarsus 0·62, culmen 0·35.

A large species with a short stout bill.

30. Dicæum everetti. (Plate VIII. fig. 2.)

Dicæum everetti, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 537 (December 1, 1877).

[Dinagat, ♂, June: iris greyish brown; bill brown, base orange; legs light grey.]

♂. Above dark olive-green, paler on the cheeks. Chin, throat, and breast pale grey. Remainder of underparts albescent grey tinged with palish yellow. Major coverts narrowly margined with greenish yellow. Quills above dark brown, almost black, with very narrow pale olive-green external margins. Rectrices above like the quills, narrowly tipped with albescent fringe. Under wing-coverts and axillaries pure white. Bill (dry specimen) brown at tip, yellow at base.

Wing 1·94 inch, tail 1·00, tarsus 0·50, culmen 0·37.

31. Prionochilus olivaceus. (Plate VIII. fig. 3.)

Prionochilus olivaceus, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 536 (December 1, 1877).

[Dinagat, ♀, June: iris sienna-brown; bill grey-black, base of mandible paler; legs light grey.]

♀. Entire upper surface, wing-coverts, and surface of closed wing uniform pure olive-green, which colour encircles the eye and covers the sides of the neck. Space before the eye, cheeks, sides of throat, and the upper breast grey. Lower breast, abdomen, flanks, and under tail-coverts the same grey washed faintly with olive-green, the mesial line being albescent. Chin and throat white, slightly greyish, forming a broad well-defined greyish white stripe, commencing at the chin and descending to the breast. Axillaries and under wing-coverts pure silky white. Remiges and rectrices dark brown, margined with the olive-green hue of upper plumage.

Wing 2·12 inches, tail 1·25, tarsus 0·62, culmen 0·37.

Since I described this species (*l. c.*) I have received the male, which in no way differs.

32. NECTAROPHILA SPERATA (122).

[Dinagat, ♂, June; *b*, ♀: iris brown; bill very dark brown; legs black. *c*, June: iris dark brown; bill black, mandible brown; legs black. *d*, ♂ (juv.), June: iris dark brown. *e*, Nipah, ♂, July.]

I cannot separate example *d* (♂ juv.) from examples *b* and *c* (♀). A slight supercilium, chin, throat, cheeks, and whole lower surface pale uniform greenish-yellow, above olive-green. They differ from a supposed female, ex Surigao, described (P. Z. S. 1877, p. 830) by having the chin, throat, and cheeks uniformly coloured with the breast and abdomen, but agree in the ruddy colouring of the wing when closed. A fourth example (sex not stated on label) is undistinguishable from the Surigao female previously described (*l. c.*).

33. ARACHNECHTHRA JUGULARIS (123).

[Dinagat, ♀, June.]

34. ÆTHOPYGA DUBIA, n. sp.

[Dinagat, ♂, June: iris yellow-brown; bill brown; legs dark grey; feet ochreous. *b*, ♂, June: bill and legs very dark brown. *c*, ♀, June: iris bright Indian-red; bill black; legs light brown.]

♂ (juv. ?). Above, wing-coverts, and exposed surface of quills olive-green. Uropygium bright sulphur-yellow, forming a broad yellow band. Rectrices black, edged with olive; laterals tipped with pale yellow-olive. Feathers of the lower surface ashy at their base, and all tipped pale yellow; lores the same; cheeks rather albescent-ashy. Under wing-coverts white; carpal edge very pale yellow. Quills dark brown.

♀. Like the male above described.

	Wing.	Tail.	Tarsus.	Culmen.
♂	1·82	1·12	0·62	0·75
♀	1·80	1·00	0·62	0·75

The three examples on which this species is founded are difficult to distinguish, by their plumage alone, from *Æ. bella* ♀ vel ♂

juv.; but the dimensions are considerably greater:—culmen 0·75, as against 0·50; wing 1·80, as against 1·62. Doubtless the adult male will closely resemble that of *Æ. bella*.

35. ANTHOTHREPTUS GRISEIGULARIS.

Anthothreptus griseigularis, Tweeddale, P. Z. S. 1877, p. 830.

[Sakuyok, ♂, July.]

36. RHABDORNIS MYSTACALIS (124).

[*a*. Dinagat, ♂, June: iris crimson; bill black. *b*. ♂: legs yellowish brown. *c*. ♂: legs dark grey.]

The only female in a series of seven examples wears the same dress as the males. Luzon individuals do not differ.

37. CORVUS PHILIPPINUS (125).

[Dinagat, ♂, ♀.]

Female smaller than male.

38. CALORNIS PANAYENSIS (128).

[*a*. Nipah, ♂, ♀, July. *b*. Sakuyok, ♀, July.]

39. SARCOPS CALVUS (129).

[Dinagat, ♂, June.]

40. OSMOTRERON AXILLARIS (136).

[Dinagat.)

A single example (♂), which cannot be separated from typical individuals.

41. PHABOTRERON AMETHYSTINA (139).

[Dinagat, ♀, June: iris yellowish brown.]

This, Luzon, and N. Mindanao (Butuan) examples do not differ.

42. PHABOTRERON BREVIROSTRIS.

Phabotreron brevirostris, Tweeddale, P. Z. S. 1877, p. 549.

[Dinagat, ♀, May.]

Undistinguishable from N. and S.W. Mindanao examples.

43. CARPOPHAGA ÆNEA (141).

[Dinagat.]

44. MYRISTICIVORA BICOLOR (143).

[*a*. Nipah, ♀, July: iris dark brown; bill blackish blue; feet light lead blue. *b*. Sakuyok, ♂, July.]

45. HEMIPHAGA POLIOCEPHALA (144).

[Dinagat, ♀, June. Iris Indian-yellow, passing into red on outer circumference; orbital ring and patch crimson; bill black; feet carmine; nails dark grey.]

46. Ortygometra cinerea (172).

[Dinagat, ♀, June: iris crimson.]

47. Hypotænidia torquata (177).

[Dinagat, ♀, June.]

48. Butorides javanica (197).

[*a*. Dinagat, ♀; *b*. Nipah, ♂ ♀, July: iris bright yellow; legs bright chrome-yellow.]

No date on label of Dinagat example, but killed in June.

49. Dysporus sula (214).

[Dinagat, ♂, June: iris white; feet light leaden-green; bill whitish green.]

In full white and rich brown plumage. Wing 15·30, tail 10·00, culmen 3·90, tarsus 1·60.

11. On a new Philippine Genus and Species of Bird. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received December 12, 1877.]

(Plate IX.)

Until Dr. Steere some three years ago discovered in the island of Basilan two species[1] belonging to the *Timeliidæ*, this natural family, so characteristic of the Indian region, was supposed to be unrepresented in the Philippines. Since then Mr. Everett has discovered a third species[2] in the island of Dinagat, and a fourth, the subject of this note, in the island of Negros. This last bird is so anomalous in its structure that I propose to constitute it the type of a new genus,

Dasycrotapha[3].

Base of maxilla densely clothed with short feathers, space behind the eye naked. Bill about the length of head, and formed as in *Mixornis*. Wing lengthened, longer than tail, first primary half the length of the second, which is a fifth shorter than the third, third a little shorter than the fourth, which is equal to fifth and sixth. Tail moderate and square. Tarsus strong; hallux with claw stout and long; digits short, slender; outer a little shorter than inner.

Dasycrotapha speciosa, sp. nov. (Plate IX.).

Head crested; forehead with dense short plumes covering the base of the maxilla; circle round the eye, whole space before the eye, tuft on the side of the base of mandible, chin and uppermost

[1] *Macronus striaticeps*, Sharpe, and *Dendrobiastes basilanica*, Sharpe.
[2] *Mixornis capitalis*, Tweeddale.
[3] δασύς, *villosus*, et κρόταφοι, *tempora capitis*.



Hanhart imp.

DASYCROTAPHA SPECIOSA

part of throat pure lemon-yellow; crown of the head black; postoccipital plumes yellow; nape yellowish green tipped with black; a lengthened tuft of plumes springing from above the eye bright orange; a line immediately below this tuft black; a tuft of stiff decomposed feathers springing from below the eye and extending over the ears white or greyish white; an irregular band across the throat black; dorsal feathers grey with light olive-green tips and white shafts; uropygium yellowish green; upper tail-coverts the same, tinged with rufous; lower throat and upper breast bright yellow, most of the feathers with black terminal drops; lower breast and rest of under plumage duller yellow tinged with green on the flanks; quills brown margined with yellowish olive-green, inner margin of quills pale yellow; wing-coverts dull olive-green, carpal edge and wing-lining yellow; tail dull rufous.

Wing 2·62, tail 2·37, tarsus 0·87, culmen 0·75.

Hab. Valencia, Island of Negros, ♂, August. Iris crimson; bill orange-yellow. (*Everett.*)

The hereditary affinity of this new form with *Macronus striaticeps* and *Mixornis capitalis* is betrayed by the colouring and markings of the dorsal plumage.

February 5, 1878.

Prof. St. George Mivart., F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1878.

The total number of registered additions to the Society's Menagerie during the month of January was 91, of which 43 were by presentation, 1 by birth, 41 by purchase, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 78.

The most remarkable additions during the month of January were as follows:—

1. A Japanese Wild Dog, presented by Harry Pryer, Esq., of Yokohama, January 1st—an animal apparently allied to the "Dhole" of India and the "Dingo" of Australia. Mr. E. W. Janson has kindly favoured me with the following extracts from two letters which he has received from Mr. Pryer on this subject.

"Yokohama, Oct. 8th, 1877.

"I have sent by the 'Loudoun Castle,' viâ New York, a fine specimen of the Japanese Wild Dog. This is an animal quite new, and is neither a Wolf nor an ordinary Dog. Its principal distinguishing features are its long narrow feet and its head; it most resembles the dog used by the hunters here, one of which is figured in Siebold. Its habits are totally different from those of any domesticated Dog. When pleased it has a most extraordinary way of laughing, and also, when pleased or very angry, has a curious dancing gait. This specimen

was taken a puppy on the slopes of Fujisan last year. I bought him for $11 in November last. He has learnt a sort of bark from the other dogs which he did not know when I first had him; he comes out sometimes with a regular wolf's howl, but not often. In his muzzle he resembles more the mainland Wolf, the northern Wolf being, like the Siberian one, very long in the nose, and those on the mainland (*C. hodophylax*) much shorter. My first impression was that this dog was a cross between a wolf and the hunter's dog; but both its parents then would have had very large round feet, which this has not. A friend told me that it is very like the Indian Dhole. In winter it has a thick coat; but in summer all the long thin hair comes out, and it then has only its coarse wiry hair on. It is a much scarcer animal than the Wolf on the mainland, which latter is rather common in the mountains, anywhere where the sheep-faced Antelope is found."

"Yokohama, Nov. 17th, 1877.

"I am trying to get a Southern Wolf (*Canis hodophylax*) to send as a present to the Society. I have sent the Wild Dog in the 'Loudoun Castle,' and should like to hear what they say about him. He is a complete puzzle to me. At one time I would look at him and think that he was only an abnormal form of the common Dog, run wild, and at other times feel as perfectly convinced that he had nothing in common with it. He has very narrow feet, clean limbs, very long canines, coarse hair in summer and plenty of long thin hair in the winter, eyes and ears like a Wolf. I heard of the animal wherever I went from the hunters, but only succeeded in getting this one, as they say it is very difficult to catch, more so than the Wolf, the capture of which is no easy task, as I know, as I have been in places where they were plentiful, but only saw one and poisoned another, although I have heard half a dozen at a time howling quite close to me in the forests of Yamato.

"My Wild Dog differs considerably from *C. lupus*, which is found in Yesso, and *C. hodophylax*, which is confined to the Main Island, although in his shorter muzzle he resembles the latter. When we know more about the cave and other recent bone-deposits of Japan, we shall be able to speak more definitely about him."

2. A young Penguin of the genus *Spheniscus*, purchased January 24th. This bird is said to have been obtained in Chili, and is probably the young of *Spheniscus humboldti*. It is very tame, and has been for the present placed in a compartment of the Fish-house, where it seems likely to do well.

Prof. St. George Mivart, F.R.S., read a Memoir entitled, "Notes on the Fins of Elasmobranchs, with Considerations on the Nature and Homologies of Vertebrate Limbs," of which the following is an abstract:—

In this paper I describe (from dissections made for the purpose) the skeleton of the paired and azygos fins, especially the dorsal fins, of *Zygæna malleus*, *Mustelus antarcticus*, *Notidanus cinereus*, *Scyl-*

lium canicula, Ginglymostoma cirratum, Chiloscyllium ocellatum, Acanthias blainvillei, Spinax niger, Pristiophorus japonicus, Pristis cuspidatus, Rhynchobates djeddensis, Trygonorhina fasciata, and *Callorhynchus antarcticus*; and I add notes made from preparations of *Lamna cornubica, Cestracion phillippi, Squatina angelus, Polyodon foliosus,* and *Polypterus bichir.*

Besides wishing to ascertain the positive conditions of skeletal structures in these forms, the examinations were partly undertaken with a view to the questions:—

(1) What is the nature of Vertebrate limbs generally?

(2) What is the relation of Piscine to other limbs?

To these questions four others are subordinate:—

A. Are the paired-limb structures of a nature distinct from that of azygos fins?

B. Are paired limbs essentially axial structures which have become more or less detached from skeletal axis, or peripheral structures which have become secondarily more or less connected with it?

C. What is the nature of limb-girdles?

D. What is the line of genesis of the cheiropterygium.

I then note and discuss the opinions on these matters of Oken, Carus, Cuvier, Owen, Maclise, Goodsir, Humphrey, Gegenbaur, Macalister, Huxley, Balfour, and Parker.

I have myself arrived at the conclusion that the nature of the paired and azygos limbs is fundamentally the same. I have, in fact, been brought to this conviction by finding various degrees of coalescence between the cartilaginous rays supporting the dorsal fins, and various degrees of connexion or continuity between such fin-supports and the subjacent axial skeleton. I have noted coalescence amongst the rays in *Scyllium canicula, Ginglymostoma cirratum,* and especially in *Notidanus cinereus,* where it is carried to such an extent that the rays are supported by one continuous basal cartilage. Continuity with the axial skeleton is described as existing in the dorsal fin-cartilages in several forms, but especially in *Pristis* and *Pristiophorus*; and I would suggest that the lateral pressure of its saw-like rostrum must be more or less aided by very firm fixation to the vertebral column of the cartilages supporting the dorsal fin.

I have found much resemblance between the skeleton of the ventral and the dorsal fins, as, for example, in *Notidanus,* in *Chiloscyllium* and *Raia*; also between the anal and ventral fins, as again in *Notidanus.* But the ventral fin of *Polyodon* is the most striking, presenting as it does a longitudinal double series of simple parallel rays, quite like the simplest form of the skeleton of the dorsal fins. Now, as the ventral and pectoral fins are admitted on all hands to be of the same nature, if the ventrals are of the same nature with the azygos fins, the pectoral ones must be also of that same nature.

As to the objection which may be drawn from the attachment of the pectoral fins to the axial skeleton by a shoulder-girdle instead of by a direct continuous longitudinal adhesion, as in some dorsal fins, I observe:—(1) The pectoral-fin support could not continuously adhere to the axial skeleton longitudinally without impeding the flexure of

the body in swimming; (2) the pectoral fins join the body at too low a level to abut directly on the vertebral column; (3) such direct connexion is prevented by the existence of the body-cavity.

I believe that the limb-girdles are lateral ingrowths from the paired-fin skeleton (an idea already suggested by Mr. J. K. Thacher of New Haven); and I believe such skeleton is the modified remnant of a longitudinal series of similar rays formed primitively in a continuous longitudinal lateral fold.

Similarly, I believe that the skeleton of the azygos fins is a structure also formed primitively in a continuous median fold, and that the dorsal rays are not outgrowths from the vertebral column. If, however, neural spines are homologous with the cartilaginous rays of dorsal fins, then it seems to follow that the spinous processes of higher animals and of man are essentially exoskeletal parts which have adhered to, and grown to be connate with the axial skeleton.

As to the caudal fin, I note a constant difference both as to the number and form of the skeletal parts of its dorsal and ventral portions, seeming to point to some genetic difference needing investigation.

I then proceed to the question of the homologies of piscine and digit-bearing limbs, adopting the view that the preaxial margin of the pectoral fin is that turned obliquely dorsad,—a matter which seems established by its innervation, apart from other proof.

I oppose the view which adopts the *Ceratodus* type of limb as the representative of the archipterygium (Elasmobranch ventrals certainly lend no vestige of support to the theory), and then consider and criticise the successive modifications of opinion expressed by Gegenbaur and Huxley.

I regard some Rays as having pectorals hypertrophied indeed, yet most like the true archipterygium (*i. e.* the least-modified by coalescence) of all Elasmobranch pectorals. As to Teleosteans, not only do I think with Günther that the arrangement of the limb-skeleton of *Ceratodus* is foreshadowed in the pectoral fin of *Acipenser*, but I think it probable that the Teleostean form of limb as seen in *Anguilla* and *Blennius* affords us indications of a very primitive type, whence the pectorals of Teleosteans on the one hand and of Elasmobranchs on the other may both have been derived.

I cannot think that the metapterygium has developed into the limb-axis of the digit-bearing limb; I believe such axis to be rather derived from the mesopterygium, or (as this is sometimes absent, as in *Chiloscyllium*, or imperfect as in *Polypterus*) from the propterygium.

The conclusions I have arrived at as to the probable genesis of Vertebrate limbs are as follows:—

(1) Two continuous lateral longitudinal folds were developed similar to dorsal and ventral median longitudinal folds.

(2) Separate, narrow, solid supports in longitudinal series, and with their long axes directed more or less outwards at right angles with the long axis of the body, were developed in varying extents in all these four longitudinal folds.

(3) The longitudinal folds became interrupted variously, the

lateral fold so as to form two prominences on each side, *i. e.* the primitive paired limbs.

(4) Each anterior limb increased in size more rapidly than the posterior limb.

(5) The bases of the cartilaginous supports coalesced as was needed according to the respective practical needs of the different separate portions of the longitudinal folds, *i. e.* the respective needs of the several fins.

(6) Occasionally the dorsal radials coalesced (as in *Notidanus* &c.) and sought centripetally (as in *Pristis* &c.) adhesion to the skeletal axis.

(7) The rays of the hinder paired limbs did so more constantly, and ultimately prolonged themselves inwards by mesiad growths from their coalesced bases, till the piscine pelvic structure arose as we see it in *Squatina*[1]

(8) The pectoral rays with increasing development also coalesced proximally, and, thence prolonging themselves inwards to seek a *point d'appui*, shot dorsad and ventrad to obtain a firm support and at the same time to avoid the visceral cavity. Thus they came to abut dorsally against the axial skeleton and to meet ventrally together in the middle line below.

(9) The lateral fins, as they were applied to support the body on the ground, became elongated, segmented and narrowed, so that probably the line of the propterygium, or possibly that of the mesopterygium, became the axis of the digit-bearing limb.

(10) The distal end of the incipient cheiropterygium either preserved and enlarged preexisting cartilages or developed fresh ones to serve fresh needs, and so grew into the developed cheiropterygium; but there is not as yet enough evidence to determine what was the precise course of this transformation.

(11) The pelvic limb acquired a solid connexion with the axial skeleton, a pelvic girdle, through its need of a *point d'appui* as a locomotive organ on land.

(12) The pelvic limb became also elongated; and in those cases where its function was quite similar to that of the pectoral limb its structure became also quite similar (*e. g. Ichthyosaurus, Plesiosaurus, Chelydra,* &c.); but for the quadrupedal mode of progression it became segmented and inflected in a way generally parallel with, but (from its mode of use) in most cases in part inversely to, the inflections of the pectoral limbs.

The amount of apparently spontaneous change needed to effect these transformations may appear excessive; but I believe that the excessive plasticity of the animal organism is generally too little appreciated—a plasticity which results in and is evidenced by the many instances we now know of the independent origin of similar structures. The plasticity of animals might be expected to be great; for plasticity is bodily reaction in response to external stimuli. The response which is most rapid and complete is sensation; and an animal is a creature

[1] This view has been put forward by Mr. J. K. Thacher of New Haven, Connecticut. See Connecticut Trans. vol. iii.

the essence of which is "impressibility," and may be described as a more or less complex arrangement for carrying about, nourishing, and propagating a plexus of sensations.

The two initial questions may then, in conclusion, be answered as follows:—

(1) Vertebrate limbs are differentiations of continuous lateral folds. They are therefore not limited to four, and are for locomotive convenience. There might apparently be several successive paired limbs on each side, just as there are often several successive dorsal fins paired; and azygos fins and limbs being of the same nature, each separate part may be called a pterygium, and for the sum total of the whole the term *sympterygium* may be employed.

(2) Piscine limbs are related to digit-bearing limbs as structures which have diverged less from the primitive condition, a natural consequence of fishes making use of their fins in that medium in which the primitive continuous lateral folds were first developed.

This paper will be puplished entire in the Society's Transactions.

The following papers were read:—

1. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. VII. On the Birds of Cape York and the neighbouring Islands (Raine, Wednesday, and Booby Islands). By W. A. Forbes, F.Z.S.

[Received December 18, 1877.]

The collection of Birds made by H.M.S. 'Challenger' at Cape York and in its neighbourhood, of which the following is an account, comprises 61 skins, referable to 37 species. As might have been expected, all, or nearly all, belong to well known Australian forms, one or two only being left uncertain for want of more materials and on account of the immature condition of the specimens. Most of the skins are in excellent condition; and their value is much increased by the notes in Mr. Murray's journal as to the colour of the soft parts &c. Besides Cape York, Raine Island (at the end of the Barrier Reef), Wednesday Island (in Torres Straits), and Booby Island (also in Torres Straits) were visited, and collections made. I copy the following extracts from Mr. Murray's journal as regards the localities where birds were obtained:—

"Raine Island, Barrier Reef, Australia. Ship landed two boats for nearly three hours. The following birds were taken" (several sea-birds, *Rallus pectoralis*, and *Strepsilas interpres*).

"Cape York, Somerset. Ship arrived on evening of 1st Sept., 1874; left Cape York on Sept. 8th." (44 skins were obtained here).

"Wednesday Island, Torres Straits. Parties landed the same day (Sept. 8). Most of the birds seen were the same as those shot

about Cape York. The following two, however, have not been procured at Cape York; they were shot on shore (*Totanus incanus* and *Ægialites inornatus*). A great many flocks of Bee-eaters were noticed making passages between the islands."

"On 9th Sept., 1874, a party landed on Booby Island, a very small island, with only a few shrubs on it. The following land birds were shot or brought on board; and in addition a Rail was seen, a *Megapodius*, and one other land bird." (The species obtained were *Todirhamphus sanctus*, *Merops ornatus*, *Zosterops luteus*, *Pachycephala* sp., *Ptilopus superbus*, and *Syncœus cervinus*.)

In the following list I have, with a few exceptions, followed the arrangement and nomenclature of Mr. Gould's 'Hand-book to the Birds of Australia.'

1. NINOX BOOBOOK (Lath.).

Ninox boobook, Sharpe, Cat. of B. ii. p. 168.

Spiloglaux marmoratus, Gld. Handb. B. Austr. i. p. 73.

One male skin of this species from Cape York. No. 167. "Stomach contained insects" (Murray, MS.).

The specimen sent agrees generally with two skins in Mr. Godman's collection from the same locality, and with Mr. Gould's description of *Spiloglaux marmoratus*, which Mr. Sharpe, in the second volume of his catalogue, treats as "the adult of the large form of *N. boobook*" (*l. c.* p. 170).

2. PODARGUS PAPUENSIS, Quoy & Gaim.

Podargus papuensis, Quoy & Gaim. Voy. de l'Astrol. Ois. t. 13; Gould, B. of Austr. Supp. pl.; id. Handb. B. Austr. i. p. 91.

"No. 186, ♀. Eyes red, feet and bill light yellow. Stomach contained insects." Cape York, one specimen.

3. MEROPS ORNATUS, Lath.

Merops ornatus, Gld. B. of Austr. ii. pl. 16; id. Handb. i. p. 117.

In all four specimens of this common Australian species. Two females from Booby Island (Nos. 199, 200), and a pair (♂ & ♀) from Cape York (nos. 147 and 178). Of all the eyes are stated to be "red," and the feet and legs black, except the female from Cape York, which is described as having the legs "with violet tint." The three females differ considerably from one another in the length of the produced middle tail-feathers; in the male the produced part is thinner and at least twice as long as in the other sex.

4. TODIRHAMPHUS SANCTUS (Vig. & Hors.).

Todirhamphus sanctus, Gld. Handb. B. Austr. i. p. 128; Sharpe, Alced. pl. 91.

One specimen from Booby Island. "No. 192, ♂. Eyes black; mandibles black, except base of lower one, which is whitish. Stomach had remains of a crab."

5. HALCYON MACLEAYI, Jard. & Selby.

Halcyon macleayi, Jard. & Selby, Ill. Orn. vol. iii. pl. 101; Gld. B. of Austr. ii. pl. 24; Sharpe, Alc. pl. 78.

Cyanalcyon macleayi, Gld. Handb. B. Austral. i. p. 133.

One male specimen from Cape York. "No. 161. Eyes, bill, and legs black. Stomach contained insects."

6. ARTAMUS LEUCOPYGIALIS, Gld.

Artamus leucopygialis, Gld. B. of Austr. ii. pl. 33; id. Handb. i. p. 154.

One specimen from Cape York. "No. 177, ♂. Bill blue tipped with black, feet black. Stomach contained insects."

7. GRAUCALUS HYPOLEUCUS, Gld.

Graucalus hypoleucus, Gld. B. of Austr. ii. pl. 57; id. Handb. i. p. 196.

One skin of this species from Cape York. "No. 151, ♀. Legs, bill, and eyes black. Stomach contained insects."

8. PACHYCEPHALA, sp. inc.

"No. 196, ♂. Pachycephala. Eyes brown, bill and legs horn-colour. Stomach had insects."

A single skin of a *Pachycephala* from Booby Island, immature, still retaining some of the rufous feathers characteristic of immaturity in its wings. It is certainly one of the species which, when adult, are yellow beneath, the under tail-coverts being bright gamboge-yellow. The species of this group are so hard to determine, unless males and in adult plumage, that it seems better to leave this bird, although not exactly like any *Pachycephala* I have been able to examine in the British Museum or in Mr. Godman's collection, without a name for the present, more particularly as Mr. Sharpe is, I believe, now working at this group for the next volume of his catalogue.

9. PINAROLESTES RUFIGASTER (Gld.).

Colluricincla rufigaster, Gld. B. of Austr. i. p. xxxvii; id. Handb. B. Austr. i. p. 226.

Pinarolestes rufigaster, Sharpe, Cat. of B. iii. p. 296.

"No. 170, ♀. Shrike."

One specimen, from Cape York, of this difficult genus. Mr. Gould, to whom I showed the specimen, was inclined to identify it with his *Colluricincla parvissima*[1] (Ann. & Mag. N. H. ser. 4, x. p. 114), and has kindly lent me the type of that species (which Mr. Sharpe, *t. c.* p. 297, treats as the young of *P. rufigaster*) for comparison. I find, however, that the Cape-York bird has a distinctly shorter wing, a stronger and more arched bill, and is less rufous on the underside. Mr. Sharpe, who has recently worked up this group for his catalogue, has examined this specimen, and refers it to *P. rufigaster*.

[1] Count Salvadori suggests that this really = *P. megarhynchus* of New Guinea.

10. MANUCODIA GOULDI, Gray.

Manucodia gouldi, Gld. Handb. B. Austr. i. p. 236; Sharpe, Cat. of B. iii. p. 181.

Manucodia keraudreni, Gld. B. Austr. Suppl. pl. 9.

Two female specimens. "No. 152. Bower-bird. Eyes orange, bill and legs black. Stomach contained small seeds. For curious loop in the wind-pipe see body. This bird was shot on the island opposite Somerset by Moseley." The colours of the soft parts and contents of the stomach are the same in the other specimen.

The two skins sent agree well with Mr. Sharpe's description and differ from Mr. Elliot's figure of the New-Guinea species (*M. keraudreni*) in the points noticed in Gray's original description of the species. The curious conformation of the trachea in *M. keraudreni* has long been known, having been originally described by Lesson. Beccari (Ibis, 1876, p. 252) says he thinks it probable that this is a peculiarity of the male sex. Mr. Murray's notes, however, would seem to contradict this view, unless, as is hardly likely, two species otherwise so nearly allied should differ in this peculiarity.

11. PTILORHIS ALBERTI, Elliot.

Ptiloris alberti, Ell. P. Z. S. 1871, p. 583; id. Mon. Parad. pl. xxiv.; Sharpe, Cat. of B. iii. p. 156.

Ptiloris magnificus, Gould, B. Austr. Supp. pl. 51.

Craspedophora magnifica, id. Handb. i. p. 595.

Six skins of this Rifle-bird from Cape York, four of which are adult males in full plumage, and one a female. Another, marked ♀, is either a young male coming into full plumage, or more probably an aged female assuming male plumage, as some of the feathers on the top of the head show traces of a metallic blue colour, as also do the shoulder, whilst more or fewer of the primaries on each side have acquired the black colour characteristic of the male. Of Nos. 164 and 165 it is noted in Mr. Murray's journal:—"Males: eyes, bill, and legs black, soles of the feet yellow. The stomach contained a red fruit, with a large stone about the size of a pea. Some parts of insects in 165." Of No. 184, "Female: eyes black; stomach contained ants and grubs." Besides the specimens sent, several others seem to have been procured. An interesting account of the shooting of these specimens will be found in Lord George Campbell's 'Log Letters from the 'Challenger,'' p. 185.

12. MIMETA VIRIDIS (Lath.).

Mimeta viridis, Gld. Handb. B. Austr. i. p. 462.

Oriolus viridis, Gld. B. Austr. iv. pl. 13; Sharpe, Cat. of B. iii. p. 212.

A young male from Cape York, agreeing generally with Mr. Sharpe's description (*l. c.*) of the young bird. "No. 169, ♂. Thrush."

13. MIMETA FLAVOCINCTUS (King).

Mimeta flavocincta, Gld. Handb. B. Austr. i. p. 466.

Oriolus flavocinctus, Gld. B. of Austr. iv. pl. 14.
Oriolus flavicinctus, Sharpe, Cat. of B. iii. p. 206.

An adult male from Cape York, agreeing with skins in Mr. Godman's collection, collected by Cockerell. "No. 189, ♂. Shrike. Eyes red, bill red, feet bluish."

14. SPHECOTHERES FLAVIVENTRIS, Gld.

Sphecotheres flaviventris, Gld. B. of Austr. Suppl. pl. 37; id. Handb. B. Austr. i. p. 468; Sharpe, Cat. of B. iii. p. 225.

Three specimens from Cape York, of which two are males in full plumage, agreeing with specimens in Mr. Godman's collection. "Nos. 172, 173. Eyes black, feet flesh, bill black." The third specimen is marked female ("No. 174, ♀. Eyes black, bill horn, legs brownish. Stomach contained insects and seeds"), but, as there are traces of yellow on the breast, is more probably a young male assuming the adult plumage. The orbits in this bird (in the skin) are dark brownish black, not yellow, though this is probably accidental. In other points, too, particularly in the plainly striated under tail-coverts, and the colouring of the upper surface of the head, the specimen hardly agrees with Mr. Gould's description of the female *S. flaviventris*. Mr. Gould, to whom I have shown it, would give no decided opinion on it; but Mr. Sharpe has examined it, and pronounces it to be of this species.

15. PTILOTIS CHRYSOTIS, Lewin.

Ptilotis chrysotis, Gld. B. of Austr. iv. pl. 32.
Ptilotis lewinii, Swains.; Gld. Handb. B. Austr. i. p. 503.

Three skins of this common Australian species, which is not recorded from N. Australia in the 'Hand-book'—two from Cape York, one from Cape-York Island. "No. 150, ♀. Eyes brown, legs slate, bill black. Stomach contained insects." "No. 157, ♂. Eyes brown, bill black, legs blue, different from No. 156 (*P. filigera*). Stomach contained insects, same as 156."

16. PTILOTIS FILIGERA, Gld.

Ptilotis filigera, Gld. B. of Austr. Suppl. pl. 42; id. Handb. B. Austr. i. p. 522.

A single example, from Cape-York Island, of this distinct Honey-eater, originally described by Mr. Gould from this district. "No. 156, ♂. Eyes brown, bill black, legs bluish. Stomach contained insects and small brown bodies like seeds."

17. PHILEMON BUCEROIDES, Swainson.

Tropidorhynchus buceroides, Gld. B. of Austr. Suppl. pl. 44; id. Handb. B. Austr. i. p. 547.

One specimen from Cape York, agreeing with specimens in Mr. Godman's collection. "No. 160, ♀. Leatherhead. Eyes dark red, bill and skin about the head black. Stomach contained beetles and other insects."

18. MYZOMELA OBSCURA, Gld.

Myzomela obscura, Gld. B. of Austr. iv. pl. 67; id. Handb. B. Austr. i. p. 559.

A single skin from Cape York. "No. 159, ♂. Eyes brown[1]."

19. DICÆUM HIRUNDINACEUM (Shaw).

Dicæum hirundinaceum, Gld. B. of Austr. ii. pl. 34; id. Handb. B. Austr. i. p. 581.

A single specimen in full plumage, from Cape York. "No. 149, ♂. Eyes black, legs and bill black. Stomach contained green fruit."

20. NECTARINIA FRENATA, Müll.

Nectarinia australis, Gld. B. of Austr. Suppl. pl. 45; id. Handb. B. Austr. i. p. 584.

Three specimens from Cape-York Island (two males in full plumage, and a female) of this Sun-bird, which Mr. Sclater has recently shown to be the *Nectarinia frenata* of Müller (see P. Z. S. 1877, p. 104). "No. 153, ♂; 154, ♂; 155, ♀. Eyes brown, legs and bill black. Stomach contained small insects."

21. ZOSTEROPS LUTEUS, Gld.

Zosterops luteus, Gld. B. of Austr. iv. pl. 83; id. Handb. B. Austr. i. p. 590.

One specimen from Booby Island ("No. 197, ♀. Eyes brown, feet and bill with a bluish tinge. Stomach had small seeds"), which agrees with a specimen of this species collected by Macgillivray, kindly lent to me by Mr. Gould for comparison.

22. CACOMANTIS FLABELLIFORMIS (Lath.).

Cacomantis flabelliformis, Gld. Handb. B. Austr. i. p. 618.

Cuculus cineraceus, Gld. B. of Austr. iv. pl. 86.

A female, from Cape York, of this Cuckoo, agreeing with specimens in Mr. Godman's collection, except in having the breast and underparts much duller rufous, and faintly freckled and banded with dusky—indications, probably, of a young bird. "No. 146, ♀. Cuckoo. Eyes brown, legs yellow on hind aspect, brown on front, bill brown. Contained insects in stomach."

23. CENTROPUS PHASIANUS (Lath.).

Centropus phasianus, Gld. B. of Austr. iv. pl. 92; id. Handb. B. Austr. i. 634.

A female from Cape York. "No. 163. Legs bluish, bill horn. Stomach contained insects."

24. MICROGLOSSUM ATERRIMUM (Gmel.)

Microglossum aterrimum, Gld. B. of Austr. Suppl. pl. 61; id. Handb. B. Austr. ii. 27; Finsch, Pap. i. p. 370.

A pair of specimens from Cape York. "No. 185, ♂: eyes

[1] Mr. Gould says "bright red."

black; stomach contained seeds and fruit. No. 188, ♀: stomach contained fruit, same as 185." The male has the beak larger, and feathers of the crest more developed than the female.

25. TRICHOGLOSSUS SWAINSONII, Gld.

Trichoglossus swainsonii, Gld. B. of Austr. v. pl. 28.
Trichoglossus multicolor, Gld. Handb. B. Austr. ii. p. 93.

A pair of this well-known species from Cape York. "No. 145, ♂. Legs and eyes grey. Bill orange, with a darker tinge. Green fruit." "No. 166, ♂. Same as 145."

This species of *Trichoglossus* is not recorded from the north part of Australia in Mr. Gould's Hand-book, though, as noticed by Finsch (Papag. ii. p. 822 and 824), it extends northwards as far as Cape York.

26. PTILOPUS SUPERBUS (Temm.).

Ptilonopus superbus, Gld. B. of Austr. v. pl. 57.
Lamprotreron superbus, id. Handb. B. Austr. ii. p. 108.

Two males and a female, from Booby Island, of this Fruit-pigeon. "No. 193, ♀; 194, ♂. Eyes yellow, bills greenish, feet red. Stomachs had nothing in them." "No. 198, ♂. Dove; same as 194. Stomach contained nothing."

27. CARPOPHAGA ASSIMILIS, Gld.

Carpophaga assimilis, Gld. B. Austr. Suppl. pl. 67.
Megaloprepia assimilis, Gld. Handb. B. Austr. ii. p. 111.

A male from Cape York, agreeing in coloration and size with specimens in Mr. Godman's collection. "No. 180: Feet green, eyes red, bill greenish yellow, red at base and about nostrils."

28. GEOPELIA HUMERALIS (Temm.).

Geopelia humeralis, Gld. B. of Austr. v. pl. 72.
Erythrauchæna humeralis, id. Handb. B. Austr. ii. p. 142.

One from Cape York. "No. 171, ♂. Eyes red, feet purple, bill black. Stomach contained fruit."

29. GEOPELIA TRANQUILLA, Gld.

Geopelia tranquilla, Gld. B. Austr. v. pl. 73; id. Handb. B. Austr. ii. p. 144.

A single specimen, apparently immature, of this little ground-dove from Cape York. "No. 148, ♀. Eyes white, cere blue, bill slate, legs pale flesh-colour. Stomach contained small seeds."

30. MEGAPODIUS TUMULUS, Gld.

Megapodius tumulus, Gld. B. of Austr. v. pl. 79; id. Handb. B. Austr. ii. p. 167.

A single specimen, unsexed, of a Megapode, from Cape York, agreeing with Mr. Gould's description of *M. tumulus*. "No. 168."

31. TALEGALLA LATHAMI (Gray).

Talegalla lathami, Gld. B. of Austr. vi. pl. 77.

A male from Cape York, a district from which it is not recorded by Mr. Gould.

"No. 187. Eyes yellow[1], head red. Stomach contained seeds."

32. TURNIX MELANOTA, Gld.

Turnix melanotus, Gld. Handb. B. Austr. ii. p. 182.

Hemipodius melanotus, B. of Austr. v. pl. 84.

Two females of this species, originally described by Mr. Gould from Moreton Bay, agreeing perfectly with the description in the 'Hand-book.' "No. 176. Cape York, Albany Island. Eyes white, feet yellow, bill yellow and black. Stomach contained insects." "No. 195. Booby Island. Eyes white, legs yellow, base of bill yellow, tip black. Stomach contained small round seeds."

33. SYNŒCUS CERVINUS, Gld.

Synœcus cervinus, Gld. Handb. B. Austr. ii. p. 195.

A Quail, from Cape-York Island, which agrees with specimens of this species in Mr. Gould's collection. "No. 175, ♂. Eyes brown, feet yellow, (bill?) bluish black."

34. ÆGIALITES INORNATUS (Gld).

Hiaticula inornata, Gld. B. of Austr. vi. pl. 19.

Ochthodromus inornatus, Gld. Handb. B. Austr. ii. p. 237.

A female, from Wednesday Island, agreeing with specimens in Mr. Godman's collection, but with the markings on the face and the pectoral band somewhat darker. "No. 191. Wednesday Island. Eyes, legs, and bill black."

35. TOTANUS INCANUS (Gm.).

Totanus pulverulentus, Müll. Natuurk. Verhand. Land- en Volkenk. p. 152.

Totanus griseopygius, Gld. B. of Austr. vi. pl. 38.

Gambetta pulverulentus, Gld. Handb. B. Austr. ii. p. 268.

One from Wednesday Island. "No. 190, ♀ Sandpiper. Legs yellow, bill blackish, eyes black. Stomach contained remains of Crustacea."

36. STREPSILAS INTERPRES, L.

Three specimens from Raine Island. "No. 128, ♂. Eyes brown, feet light red with black claws, bill black. Stomach contained small calcareous particles." "No. 129, ♀. Same as 128." "No. 142, ♀. Same as 128."

37. RALLUS PECTORALIS, Gld.

Rallus pectoralis, Gld. B. Austr. vi. pl. 76.

Two males and a young female, from Raine Island, of this well-

[1] "Brown," according to Mr. Gould; his was probably a younger bird.

known species. The young bird, No. 130, resembles the old one generally in coloration, but has all the colours duller, the transverse barring of the lower surface much less conspicuous and altogether wanting on the breast, the white spots of the scapularies absent, those on the wing-coverts smaller, and those on the tertiaries also smaller, and tinged with rufous; the primaries also are less conspicuously banded with rufous.

"Nos. 126, 127, males. Eyes red, upper mandible dark, the lower with a slight red tinge, feet light brown. Stomach contained beetles, egg-shells, and small calcareous particles."

2. On a Collection of Birds from Abeokuta. By Francis Nicholson, F.Z.S.

[Received December 20, 1877.]

(Plate X.)

I have lately received from my friend, Mr. Henry Robin, a small collection of birds made by him in the neighbourhood of Abeokuta. Although preserved in spirits, the birds arrived in very good condition, and have made fair specimens. On showing them to my friend Mr. R. Bowdler Sharpe, he strongly advised me to publish a short list of the species, inasmuch as we have never received any natural-history specimens from Abeokuta before. This collection also adds a species or two to the avifauna of Western Africa; and one bird appears to be new. I have deposited a series of the skins in the British Museum; and Mr. Sharpe has confirmed my identifications. I am indebted to him for a comparison of some of the more obscure species.

1. Scops leucotis (Temm.); Sharpe, Cat. B. ii. p. 97.

One specimen, which has apparently died in captivity. I am not aware of the occurrence of this species in West Africa below Senegal having been noted.

2. Melænornis edolioides (Sw.); Sharpe, Cat. B. iii. p. 315.

One specimen, somewhat extending the range of this species in Western Africa.

3. Lanius smithii, Fraser; Sharpe, Cat. Afr. B. p. 50. no. 478.

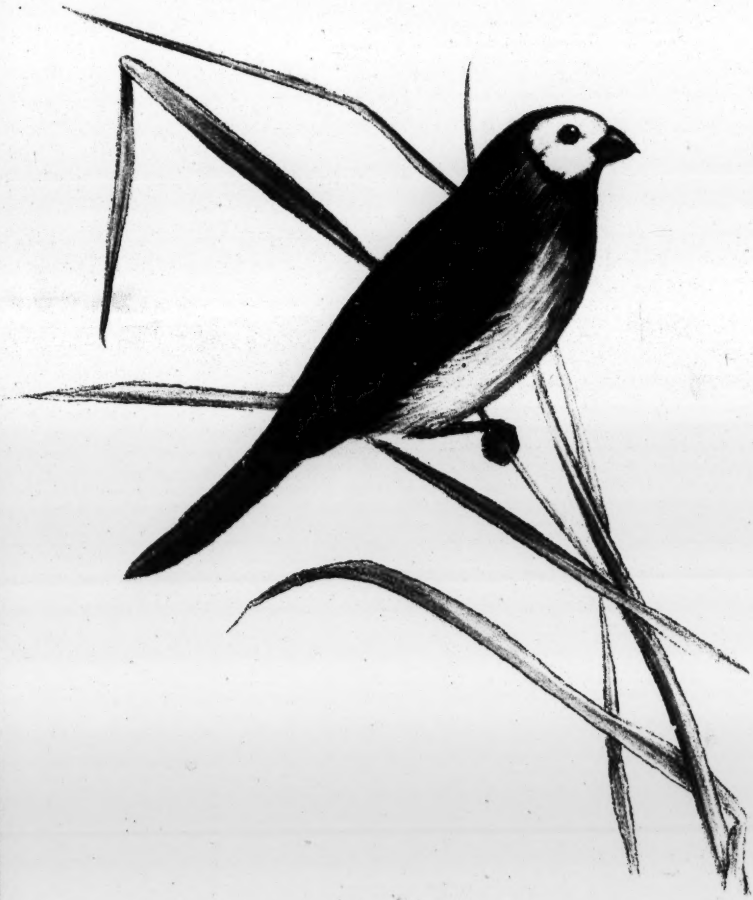
Two adults, and three young birds in changing plumage; all apparently males, with no red on the flanks.

4. Dryoscopus gambensis (Licht.); Sharpe, Cat. Afr. B. p. 48. no. 453.

One male specimen.

5. Dryoscopus major, Hartl.; Sharpe, Cat. Afr. B. p. 47. no. 450.

An adult specimen.



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6. Butalis grisola (L.); Sharpe, Cat. Afr. B. p. 42. no. 391.
One specimen.

7. Elminia longicauda (Sw.); Sharpe, Cat. Afr. B. p. 42. no. 400.
Four specimens.

8. Bias musicus (V.); Sharpe, Cat. Afr. B. p. 43. no. 403.
An adult male.

9. Platystira cyanea (Müll.); Sharpe, Cat. Afr. B. p. 44. no. 412.
A large series of specimens, containing both sexes and the young birds.

10. Hirundo æthiopica (Blanf.); Sharpe, Cat. Afr. B. p. 46, no. 432.
The first occurrence of this Swallow in Western Africa. I have compared it with several specimens from North-eastern Africa in the British Museum, and I have no hesitation in pronouncing it to be *H. æthiopica*. It is not quite so purple as Bogos-Land skins; but this is probably due to the fact of its having been preserved in spirits.

11. Turdus icterorhynchus, Cab.
T. pelios, Sharpe, Cat. Afr. B. p. 21. no. 187 (nec Bp.).
Four specimens.

12. Criniger simplex (Temm.); Sharpe, Cat. Afr. B. p. 22. no. 197.
Four specimens.

13. Pycnonotus barbatus (Desf.); Sharpe, Cat. Afr. B. p. 23. no. 214.
Five specimens.

14. Cossypha verticalis, Hartl.; Sharpe, Cat. Afr. B. p. 26. no. 237.
Three specimens.

15. Hypolais opaca (Licht.); Dresser, B. Eur. part xxviii.
One specimen.

16. Cinnyris fuliginosus (Shaw).
Nectarinia fuliginosa, Sharpe, Cat. Afr. B. p. 39. no. 362.
One specimen.

17. Cinnyris splendidus (Shaw).
Nectarinia splendida, Sharpe, Cat. Afr. B. p. 38. no. 357.
One specimen.

18. CINNYRIS VENUSTUS (Shaw).

Nectarinia venusta, Sharpe, Cat. Afr. B. p. 40. no. 376.

Three specimens.

19. PHOLIDAUGES LEUCOGASTER (Gm.); Sharpe, Cat. Afr. B. p. 54. no. 514.

Two pairs, the males exhibiting the very extreme of the bluish and reddish purple shades prevalent in this species.

20. HYPHANTORNIS BRACHYPTERA (Sw.); Sharpe, Cat. Afr. B. p. 59. no. 561.

One example.

21. HYPHANTORNIS TEXTOR (Gm.); Sharpe, Cat. Afr. B. p. 59. no. 257.

Two adult males.

22. NIGRITA CANICAPILLA (Strickl.); Hartl. Orn. W.-Afr. p. 130.

The single specimen sent is more ashy and not of such a clear cinereous grey as Gaboon examples, and the spots on the wings are smaller; the shade, however, may be owing to the specimen having been preserved in spirits. The conspicuous white spots on the wings and the white rump show that the bird belongs to *N. canicapilla* and not to *N. emiliæ*.

23. EUPLECTES FRANCISCANA (Isert); Sharpe, Cat. Afr. B p. 62. no. 588.

Four adult males in full plumage.

24. VIDUA PRINCIPALIS (L.); Sharpe, Cat. Afr. B. p. 63. no. 600.

A female bird.

25. HYPOCHERA CHALYBEATA (Müll.); Sharpe, Cat. Afr. B. p. 64. no. 604.

26. PYRENESTES CAPITALBUS (Temm.); Sharpe, Cat. Afr. B. p. 68. no. 650.

A female bird, doubtless belonging to this species.

27. SPERMOSPIZA HÆMATINA (V.); Sharpe, Cat. Afr. B. p. 68. no. 653.

One specimen, not in full plumage.

28. CRITHAGRA CHRYSOPYGA (Sw.); Sharpe, Cat. Afr. B. p. 67. no. 638.

One specimen.

29. AMADINA SHARPII, n. sp. (Plate X.).

Supra olivascenti-flava, tectricibus alarum dorso concoloribus; remigibus fuscis, extùs dorsi colore marginatis, secundariis in-

ternis dorso concoloribus: caudâ olivascenti-flavâ, rectricibus exterioribus intùs fuscis; pileo summo colloque postico cinereis; fronte angustâ, loris et facie laterali albis; lineâ angustâ pone-auriculari nigrâ; guld totâ nigrâ; jugulo et pectore summo cinereis; abdomine, subcaudalibus tibiisque cinerascentibus; corpore laterali lætè flavo; subalaribus fulvis, flavo lavatis; margine alari flavo; remigibus infrà brunneis, intùs albicanti marginatis; rostro nigro; pedibus brunneis. Long. tot. 4·3, *culm.* 0·4, *alæ* 2·35, *caudæ* 1·95, *tarsi* 0·65.

The accompanying figure will give a good idea of this beautiful little Finch, which is not allied to any other African species, and appears to be quite new to science.

30. CYPSELUS PARVUS (Licht.); Sharpe, Cat. Afr. B. p. 2. no. 13.

One specimen.

31. MEROPS SUPERCILIOSUS (L.); Sharpe, Cat. Afr. B. p. 3. no. 21.

One specimen.

32. ISPIDINA PICTA (Bodd.); Sharpe, Cat. Afr. B. p. 7. no. 53.

Five specimens.

33. HALCYON SENEGALENSIS (L.); Sharpe, Cat. Afr. B. p. 8. no. 66.

One specimen.

34. CHRYSOCOCCYX KLAASI (V.); Sharpe, Cat. Afr. B. p. 13. no. 112.

Ten specimens, in all states of plumage.

35. BARBATULA SUBSULPHUREA (Fras.); Sharpe, Cat. Afr. B. p. 16. no. 139.

Three specimens.

36. DENDROPICUS GOERTÆ (Müll.); Sharpe, Cat. Afr. B. p. 18, no. 165.

One specimen.

37. PERISTERA TYMPANISTRIA (Temm.); Hartl. Orn. W.-Afr. p. 197.

One specimen.

38. ACTITIS HYPOLEUCUS (L.): Hartl. Orn. W.-Afr. p. 235.

One specimen.

3. On the Manifestation of Anger, Fear, and other Passions, in Fishes, and on the Use of their Spines.[1] By the Rev. S. J. Whitmee, C.M.Z.S.

[Received January 2, 1878.]

In his remarks on the erection of the dermal appendages by various animals under the excitement of anger and terror Mr. Darwin ('Expression of the Emotions in Men and Animals') confines himself to "three of the great Vertebrate classes," viz. mammals, birds, and reptiles (p. 95). When I first read the passage referred to, I tried to think of some reference to the manifestation of anger by fishes in books with which I am familiar, but I failed to call any to mind. And as Mr. Darwin has not brought forward any examples as to how fishes manifest their "emotions," I am almost compelled to believe no observations have been recorded. I read, too, in the article 'Ichthyology,' in the 'Encyclopædia Britannica' (vol. xii. p. 221, 8th ed.), after a fanciful comparison between birds and fishes, to the great disadvantage of the latter, that "the silent dweller in the deep knows few attachments, expresses no language, cherishes no affections, . . . the cravings of hunger seem alone to exercise a frequent and influential action over his monotonous movements;" and that "by whatever scenes in nature fishes are surrounded, their perceptions are probably indistinct and dull"[2].

Notwithstanding that so little appears to be written on the manifestation of feeling by fishes, it strikes me many persons who have kept an aquarium must have noticed that they show anger quite as plainly as any other animals.

For some time past I have kept a good sized aquarium for the instruction and amusement of myself and my family. My house is situated on the coast, and has a belt of shallow and smooth water before it, formed by the coral-reef which runs along in front of it nearly a mile out at sea. This lagoon is a fine place for fishes; and I encourage the natives to bring me any thing remarkable they obtain when fishing there. I have therefore often had fishes belonging to several genera together in my aquarium. Amongst other things I have had opportunities of watching their quarrels, which are by no means infrequent among the individuals of the same species, and which are of constant occurrence between different species and genera. The signs of anger in most fishes are so obvious that one of my boys, between three and four years old, who is fond of making his own observations in natural history, knows an angry fish as well as most people know an angry bull or an angry boar.

[1] This paper was written in Samoa, in October 1875, and is given in its original form. S. J. W., December 27, 1877.

[2] There are other remarks in the article mentioned which, I presume, will be corrected in the new edition of the 'Encyclopædia'—such, *e. g.*, as the statement that the elegant and diversified colours of fishes are probably for the special gratification of man. Unfortunately these quickly disappear when man gets possession of the fish.

When swimming in a placid condition, the anterior portion of the dorsal fin in fishes is seldom elevated; hence the spines which occupy this position are laid back more or less closely, and are often scarcely visible[1]. The anal fin is also often not fully expanded; but I have not usually seen this so marked as in the dorsal. On the least fright up goes the dorsal, and the spines are at once elevated. As an example of how slight a cause will suffice to produce this change, I may mention that, before writing the last sentence, I rose from my desk and lightly tapped the front of my aquarium. The anterior dorsal fins of its inhabitants (previously laid back) were instantly elevated, and all assumed the attitude of attention. Under the influence of great anger or fear, such as would be caused by the presence of a carnivorous fish in the aquarium, the dorsal fin is raised to its extreme height, and the spines, both of the dorsal and anal fins, are very prominent. The scales all over the body are also more or less raised, and with them, of course, any other dermal appendages the particular fish may possess. This causes it to assume larger proportions than under ordinary circumstances.

I believe the spines are elevated under the influence of fear as well as by anger. I was once trying to catch a *Tetrodon nigropunctatus* which was in my aquarium, when it inflated itself and elevated the fine spines with which its body was covered, and which were previously buried in its loose and flabby skin. This of course was under the influence of fear. And this appears to give a hint as to the purpose for which this fish and those of the genus *Diodon* inflate themselves.

When I have observed fishes chasing each other, apparently in playfulness rather than anger, I have often seen them swim at each other with open mouths as if to bite. But when they have appeared to intend a serious attack they have always turned suddenly round and lashed at one another with the caudal fin. I believe serious fighting is always done with the tail. And from their anatomy one would naturally expect this to be the chief mode of attack in most fishes.

I incidentally mentioned this way of fighting by fishes in a paper recently sent to the Society, in which I described an attack made by some small fishes on an *Antennarius*[2]. These little things were evidently in great dread of their carnivorous neighbour. But, like small birds in presence of a bird of prey, they could not keep at a distance, but continually tried to torment it. In attacking it they always took care to strike at its posterior part, although this was protected by a block of coral. I said, in the paper referred to, that this mode of attack by the tail ought to be very effective in the case of an *Acanthurus*, and that it may account for the armature of the Acronuridæ.

In connexion with this subject I will mention a thought which has often occurred to me as to the chief purpose served by fishes'

[1] Drawings of fishes usually represent them with *all* the fins fully expanded and the spines prominent; but this is not their ordinary condition.

[2] See P. Z. S. 1875, p. 515.

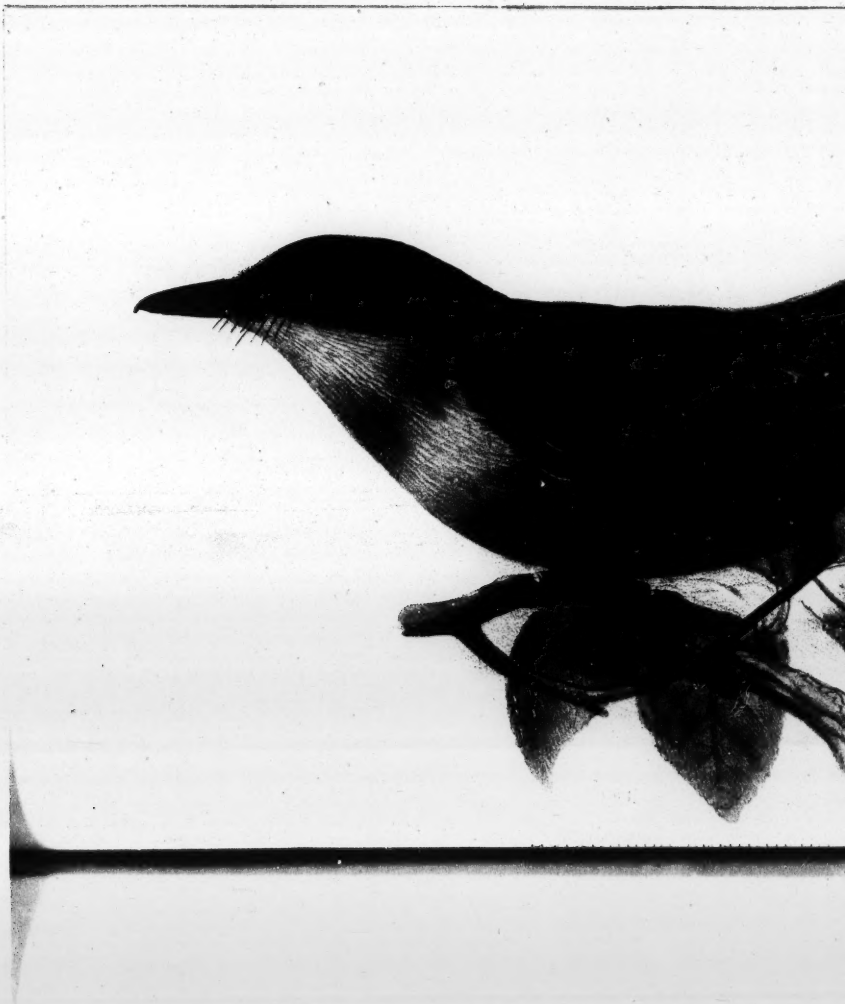
spines, viz. protection against the attacks of those of the class which are carnivorous. I have never seen a fish try to use its dorsal spines actively to strike with. But I have seen a *Balistes* swim rapidly past an antagonist, and graze its side with its file-like lateral spines. I am strongly inclined to believe the dorsal and anal spines are used for defence only.

There is little doubt that most carnivorous fish capture their prey by outswimming them, as most carnivorous quadrupeds capture theirs by outrunning them. In the shallow waters within our reefs it is a very common thing to see shoals of fish leaping out of the water when chased by the larger ones which prey upon them. They pass along with a series of springs at a great rate; and the noise they make is heard at a long distance. Most fishes thus chased would, if captured, be seized from behind. If so, the strong spines on the anal and dorsal fins, inclined as they are backwards, would often be of immense value to their possessors in preventing them from being swallowed. I am inclined to believe this is the chief, if not the sole, use of these spines[1].

If this view be correct, those fish most exposed to the attacks of others which are carnivorous ought (other things being equal) to be best protected. I have not given sufficient attention to the subject to say whether this be so or not. But from a merely superficial examination I fancy further investigation would prove that spiny fishes are more frequently found in confined and shallow waters, where they have little opportunity of escape; and that slow-swimming fishes are most frequently protected with peculiar defensive armature. The *Diodon* and *Tetrodon* may serve as examples of the latter. They swim slowly, and if unprotected would be specially liable to be preyed upon by carnivorous fish. Unless alarmed neither look formidable. In both of them the spines are ordinarily concealed in the soft and loose skin; and then they present a very different appearance from the stuffed specimens or plates by which they are chiefly known. But the individuals of both genera possess the power of very rapidly inflating their loose skins, and thus erecting the spines with which they are more or less completely covered. In the case of the *Diodon* there can be no doubt that its inflated and bristling appearance would serve to protect it from attack; and I imagine the most voracious monster would think twice before attempting to feast on the less-protected *Tetrodon*.

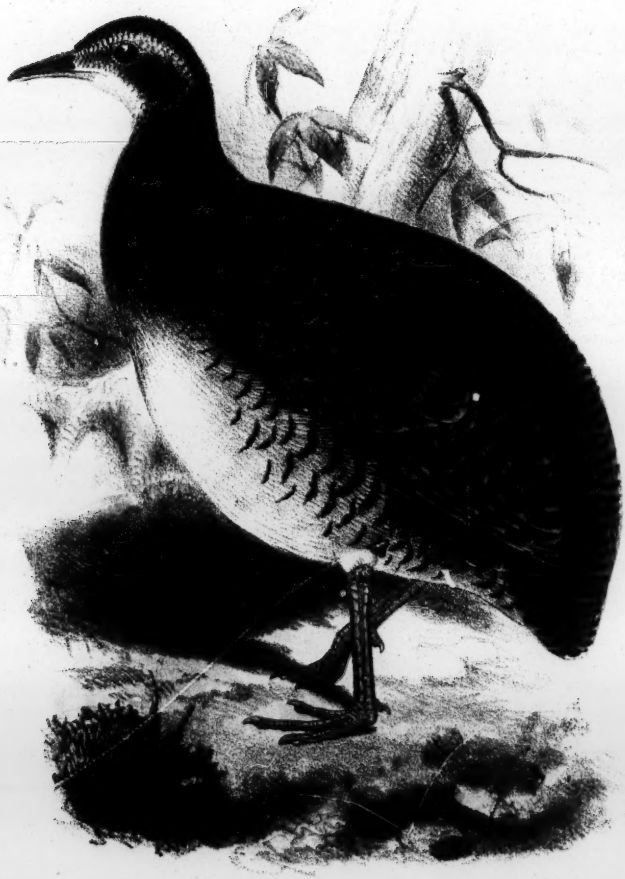
[1] Since the above was written I have seen a proof of the correctness of this view as to the use of spines. I was one day passing along the lagoon on the shores of Upolu, when my boatmen noticed a great splashing in the water at a distance. Knowing the cause, they pulled for the place. There we saw a large fish with a smaller one sticking in its jaws, caught apparently by the erected spines. They got separated just as we approached, and before my crew could secure them; but the natives told me they not unfrequently take fishes in that way. Sometimes they find both dead, one firmly sticking by its spines in the jaws of the other.—December 1877.











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CRYPTURUS TRANSFASCIATUS.

4. On the Collection of Birds made by Prof. Steere in South America. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.R.S.

[Received January 3, 1878.]

(Plates XI.–XIII.)

At the request of Prof. J. B. Steere, of the University of Michigan, U. S. A., we have had great pleasure in examining the collection of birds which he made during his recent transit across South America, from Para to Callao, and in determining and naming the specimens.

In Nov. 1870, Prof. Steere went from Para first to Vigia, on the south bank of the Amazons, near the mouth, above fifty miles below Para. Returning to Para he next visited Arare, on the south side of the island of Marajo. On finally leaving Para for the interior, in June 1871, he ascended the river to Santarem, and from Santarem visited Obidos on the north bank. From Santarem he continued upwards to Manaos, or Barra, as it was formerly called, and thence made an excursion up the Purus river to Ituchy and Marrahan. Leaving Manaos in Oct. 1871, he ascended the main stream to Pebas, in Peru, where several skins, having the well-known "make" of Mr. Hauxwell (amongst which is a skin of *Porzana hauxwelli*, nobis), were procured. From Pebas Prof. Steere continued the ascent of the river to Barrancas and Pongo Manseriche, at the foot of the Andes, but returned downwards to the mouth of the Huallaga, and then ascended that stream to Yurimaguas, where he arrived in March 1872.

Here the voyage by steam came to an end, and Prof. Steere proceeded across country, via Tarapota, Moyobamba, Rioja, Chachapoyas, and Caxamarca, to the Pacific coast at Truxillo. From Truxillo Prof. Steere kept along the coast, viâ Pacasmayo to Sorritos [1] and Tumbez, where, as will be seen by our notes, many of the local and interesting species of Western Peru were met with. From Tumbez Prof. Steere went to Guayaquil, and thence up to Quito and back. Next he proceeded to Lima by Callao, and made an excursion from the Peruvian capital up the Rimac and over the Andes, to the vicinity of Cerro de Pasco, returning finally to Callao. From Callao Prof. Steere sailed, in May 1873, for China and the Philippines, where he made those great discoveries in ornithology which have already rendered his name well known to ornithologists [2].

[1] Sorritos I do not find marked in the maps; but Professor Steere tells us it is on the coast, about 20 miles south of Tumbez.

[2] See Mr. Sharpe's memoir in Trans. Linn. Soc. n. s. Zool. vol. i. p. 307 *et seqq.* (1877).

During his journey across South America Prof. Steere made a collection of 911 skins of birds, belonging to about 362 species of the following groups:—

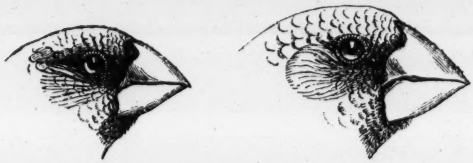
	ex.	sp.		ex.	sp.
1. Passeres	503	145	9. Herodiones ..	13	9
2. Cypseli.....	108	52	10. Anseres	5	4
3. Pici	23	17	11. Columbæ	27	14
4. Coccyges	93	45	12. Gallinæ	7	5
5. Psittaci.....	35	16	13. Grues	4	4
6. Striges.....	14	5	14. Limicolæ	41	18
7. Accipitres....	23	16	15. Gaviæ.....	7	5
8. Steganopedes.	3	3	16. Crypturi.....	5	4

As might have been expected from the fact of Prof. Steere not having made a lengthened stay at any of the localities visited, the greater number of the specimens which he collected belong to well-known species, which we have named according to our 'Nomenclator Avium Neotropicalium.' But there are examples of twenty-two species amongst them, either unknown to us or otherwise of interest, concerning which we have the following notes to offer.

1. Oryzoborus atrirostris, sp. nov.

Ater æneo-nitens unicolor; remigibus primariis ad basin albis, speculum parvum tectricibus absconditum efficientibus; rostro crasso, nigro; caudâ paulum rotundata: long. tota 6·0, *alæ* 2·9, *cauda* 2·7, *tarsi* 0·75.

a *b*



a. Head of *Oryzoborus crassirostris*.
b. Head of *O. atrirostris*.

Hab. Moyobamba, Peru (*Steere*).

Obs. Ab *O. crassirostri* et affinibus rostro robustiore et nigro diversus.

This *Oryzoborus*, of which Prof. Steere only obtained a single example, now in the Museum of the University of Michigan, is quite new to us[1]. It is readily distinguishable from *O. crassiros-*

[1] *Sporophila othello*, Bp. Consp. i. p. 498, ex Am. Centr. (Mus. Berol.) is unknown to us and indeterminable, unless the type is existent.

tris and its representative forms (*O. maximiliani, O. occidentalis,* and *O. melas*) by its black bill, which, as will be seen by the outline given, is also more robust than in *O. crassirostris.*

There is a small white speculum, which does not extend onto the outer web of the three outer primaries, and is concealed by the greater coverts when in their natural position. On the under surface of the wing the white extends barely half an inch beyond the black under wing-coverts, and then passes into grey, and at the extremities of the feathers into black.

2. PIEZORHINA CINEREA, Lafr.

Guiraca cendre, Prév. et Des Murs, Voy. 'Venus,' Ois. p. 209.

Guiraca cinerea, Lafr. Mag. de Zool. 1843, pl. 20 (subg. *Piezorhina*).

Camarhynchus cinereus, Gray and Mitch. Gen. B. ii. p. 369; Bp. Consp. i. p. 542; Salvin, Trans. Zool. Soc. ix. p. 491; Tacz. P. Z. S. 1877, p. 321.

MM. Jelski and Stolzmann first discovered the true habitat of this curious Finch, which, through an error of the Naturalists of the Voyage of the 'Venus,' had been assigned to the Galapagos.

Prof. Steere's series contains a single skin obtained in Dec. 1872, at Sorritos, in Western Peru. It is marked "male: eyes light hazel." It agrees in every respect with an example from Tumbez (*Jelski*) in Sclater's collection.

3. HÆMOPHILA STOLZMANNI, Tacz.

Hæmophila stolzmanni, Tacz. P. Z. S. 1877, p. 322, pl. xxxvi. fig. 2.

Of this recently described Finch, from the same district, Prof. Steere likewise obtained a single example at Sorritos, in Dec. 1872. It is marked "male: eyes hazel." The discovery of a typical *Hæmophila* (of which the six previously known species are entirely confined to Central America) in Western Peru is a fact of the highest interest.

4. GNATHOSPIZA RAIMONDII, Tacz.

Gnathospiza raimondii, Tacz. P. Z. S. 1877, p. 320, pl. xxxvi. fig. 1.

Of this peculiar Fringilline form Prof. Steere obtained four examples during his sojourn at Sorritos.

5. ICTERUS GRACE-ANNÆ, Cassin.

Icterus grace-annæ, Tacz. P. Z. S. 1877, p. 323.

Prof. Steere's series contains two skins of this well-marked *Icterus,* described in 1867 by the late Mr. Cassin, from a single specimen in the museum of the Academy of Philadelphia, of which the exact locality was uncertain. The western sea-board of Ecuador and Peru, however, is its undoubted habitat, as the late Prof. James Orton

obtained specimens at Machala, near Guayaquil, as recorded by Salvin (Ibis, 1874, p. 323). Jelski and Stoltzmann also found it at Tumbez, as recorded by Taczanowski, *l. s. c.*; and Prof. Steere collected two examples—one at Pacasmayo on the coast north of Truxillo, and the other at Tumbez.

6. CYANOCORAX MYSTACALIS.

Pica mystacalis, Geoffr. Mag. de Zool. 1835, pl. 34.
Cyanocorax mystacalis, Scl. et Salv. Nomencl. p. 39, et P. Z. S. 1876, p. 272; Tacz. P. Z. S. 1877, p. 323.
Cyanocorax ortoni, Lawr. Ann. Lyc. N. Y. xi. p. 166.

Of this fine species Prof. Steere obtained one example at Tumbez, where MM. Jelski and Stoltzmann also procured it. Having now, through Mr. Lawrence's courtesy, had the opportunity of examining the type of his *C. ortoni*, we are able to state that our anticipation as to its identity with *C. mystacalis* was quite correct. Prof. Orton's skin is labelled as having been obtained at "Zicapa, Peru, Oct. 22, 1874." It may be remarked, however, that, whereas in Prof. Steere's specimen the five outer pairs of rectrices are wholly white, in Prof. Orton's the pair next to the middle pair have the basal half blue and indications of like colour in the centres of the adjoining pairs. It is probably on some such specimen as this that *C. bellus* of Schlegel [1] was established.

7. EUSCARTHMUS ZOSTEROPS?

A skin of a Tyrant, obtained by Prof. Steere at Moyobamba, so nearly agrees with *E. zosterops*, Pelzeln, Orn. Bras. p. 173, that we are unwilling to separate it on the faith of a single specimen. But it is certainly larger in its dimensions [2], has a rather shorter bill, and the edgings of the wing-coverts and secondaries are paler and more distinct.

8. ORCHILUS ECAUDATUS (Lafr. et D'Orb.).

A skin of this species from Rioja, Peru, seems to agree well with Sclater's example from San Esteban (P. Z. S. 1868, p. 631). D'Orbigny's original type was from Yuracares, Bolivia.

9. MYIARCHUS SEMIRUFUS, sp. nov. (Plate XI.)

Suprà fuscescenti-cinereus; uropygio et alarum caudæque marginibus castaneis, remigum omnium et rectricum mediarum parte mediâ nigricante; subtùs ochraceo-rufus unicolor; rostro et pedibus nigris: long. tota. 7·5, alæ 3·4, caudæ 3·3, tarsi 1·0.
Hab. Pacasmayo, Peru (*Steere*).

[1] *Cf.* Scl. et Salv. P. Z. S. 1876, p. 272.

[2]

	Long. tota.	alæ.	caudæ.
Ex. ex Borba (*Natt.*)	4·0	2·0	1·7
„ Moyobamba (*Steere*)	5·0	2·2	2·1

Although so abnormal in colour, we cannot arrange this bird, of which Prof. Steere unfortunately obtained but a single specimen, as otherwise than a typical *Myiarchus*. The wings are rather short, the third, fourth, and fifth primaries being nearly equal and longest. The wing-end, embracing the first five or six primaries, is black, as are the centre portions of the other remiges; but the latter are bordered above and below with rufous. In the tail the black colour is confined to the inner webs of the three middle pairs of rectrices, the two outer pairs being wholly rufous, and the next pair having only a slight trace of the black patch.

10. MACHÆROPTERUS PYROCEPHALUS, Sclater.

Machæropterus pyrocephalus, Sclater, Ibis, 1862, p. 176.

Of this beautiful Manikin two examples were procured by Prof. Steere—one at Rioja, and the other at Moyobamba.

11. ATTILA TORRIDUS, Sclater.

Altila torridus, Sclater, P. Z. S. 1860, p. 280.

A single skin from Santa Rosa agrees with Sclater's types of his *A. torridus*, except in being rather brighter below and in being rather shorter in the wing. We do not think it distinguishable.

12. FURNARIUS PILEATUS, sp. n.

Suprà castaneus, superciliis albis; pileo obscure brunneo; subtùs albus, lateraliter ochraceo perfusus; remigibus nigris rufo bifasciatis; rectricibus castaneis, maculâ in pogonio interiore nigrâ præditis; rostro corneo, mandibulâ inferiore ad basin albicante; pedibus nigris: long. tota 6·8, *alæ* 3·5, *caudæ* 2·4, *tarsi* 1·1.

Hab. Santarem, Amazons (*Steere*).

Obs. F. figulo affinis, sed pileo brunneo ed pedibus majoribus diversus.

A single skin of a *Furnarius* obtained at Santarem, on the south bank of the Amazons, seems to be referable to a representative form of *F. figulus*, of S.E. Brazil, distinguishable by its dark brown cap. In *F. figulus* the head is of exactly the same colour as the back.

13. THAMNOPHILUS SIMPLEX, Sclater.

Thamnophilus simplex, Sclater, Ibis, 1873, p. 387.

A single skin obtained at Vigia exactly agrees with Sclater's type of this little-known species, now in his collection. It is marked "male: eyes red."

14. STEATORNIS CARIPENSIS.

A skin of this bird in Prof. Steere's collection is labelled as having been obtained at Caxamarca, in the Peruvian Andes. This, so far as we know, is much further south than any previously recorded locality

for this wonderful bird. Since we examined this skin, Mr. C. Buckley has sent an example of *Steatornis* from Sarayacu on the Rio Bobonaza, a confluent of the Pastaza, in Ecuador, thus connecting Prof. Steere's Peruvian locality with those hitherto known for *Steatornis* in Columbia and Venezuela.

15. PICUMNUS SCLATERI, Tacz. P. Z. S. 1877, p. 327.

We are inclined to refer a skin of a *Picumnus*, obtained at Tumbez in December 1872, to this recently described species, although in this difficult group an actual comparison of specimens is necessary to establish identity.

Prof. Steere's specimen is marked "male," but agrees with a bird described as a female by M. Taczanowski in having the head spotted with white. If, therefore, the sexes are rightly determined in both cases, it would seem that this species differs from most of its congeners in not having the head spotted with red or yellow in the male sex.

16. CHLORONERPES SEDULUS.

Campias sedulus, Cab. et Hein. Mus. Hein. iv. p. 153.
Chloronerpes sedulus, Scl. et Salv. Nomencl. p. 99.

A "male" of this little known species was obtained by Prof. Steere at Obidos, on the Amazons. Sclater's collection contains a single female from Guiana; and the type described by Cabanis and Heine was of the same sex. The male, which is hitherto undescribed, differs from the female in having the feathers of the cap terminated with red instead of yellow.

The species is easily recognizable by the large well-defined pale yellow spots on the wing-coverts. Prof. Steere notes the eyes as "blood-red."

17. COLAPTES RUPICOLA (Lafr. et D'Orb.).

Colaptes rupicola, Scl. et Salv. Nomencl. p. 101.

A "female" skin from Cajamarca, which we refer to this species, differs slightly from skins obtained in Southern Peru by Mr. Whitely (see P. Z. S. 1869, p. 154) in having the spots on the chest produced laterally into narrow transverse bands. The rump and lower surface are likewise rather deeper in colour.

The label states that the bird is found "in the Upper Andes, among the rocks; nests in mud walls; eyes sulphur yellow."

18. CAPITO STEERII, sp. nov. (Plate XII.)

Suprà lætè viridis, pileo vividè coccineo, nuchâ cæruleâ; subtùs pallidè limonaceo-flavus, plagâ gulari et alterâ subpectorali coccineis; ventre viridi flavoque variegato; rostro plumbescente, tomiis et apice flavis; pedibus obscurè plumbeis: long. tota 5·8, *alæ* 2·8, *caudæ* 1·8, *tarsi* 0·8.

Hab. Moyobamba, Peru (*Steere*).

Obs. Affinis *C. richardsoni*, sed colore corporis superioris pallidiore viridi, nuchâ cyaneâ, et pectore limonaceo-flavo sanè diversus.

Of this beautiful new *Capito*, which we have the pleasure of dedito its discoverer, there is, unfortunately, but one specimen in the collection, now in the Museum of the University of Michigan. The species is closely allied in form and disposition of colour to *C. richardsoni*, but may be distinguished by the differences pointed out above.

Among some birds lately sent by Mr. G. N. Lawrence of New York to Sclater for determination, we find an imperfect skin, evidently of the same species. It was obtained by Walter S. Church at the "head-waters of the Huallaga," during his journey up that river, and belongs to the collection of the Smithsonian Institution.

19. COLUMBULA CAMPESTRIS (Spix).

Five specimens of this species are in Prof. Steere's collection, all of them obtained at Arare, in the island of Marajo. The species, though long ago described by Spix, has seldom been met with by more recent collectors. Natterer, however, secured several examples, mostly in the Brazilian provinces of Goiaz and Cuyaba.

20. LIMOSA FEDOA (Linn.).

Limosa fedoa, Scl. & Salv. Nomencl. p. 146.

One of two specimens of this Godwit was obtained at Santa Rosa, Ecuador; the other is without precise locality. Though the allied *L. hudsonica* ranges throughout South America, this species, so far as we know, has not hitherto been noticed south of Central America.

21. XEMA SABINII, J. Sab.

Xema sabinii, Coues, Birds of the North-west, p. 660.

Prof. Steere's collection contains a single example of the Fork-tailed Gull, shot at Tumbez, Western Peru. This is the first instance of the occurrence of the species in any thing like so southern a locality, the limit of its southern range having been hitherto supposed to be the Great Salt Lake, Utah. The specimen is in adult winter plumage, the head being white, the nape and back of the neck ashy black, each feather with a very narrow white margin; the mantle is pure grey, and the primaries coloured as in the adult bird.

22. CRYPTURUS TRANSFASCIATUS, sp. n. (Plate XIII.)

Suprà ochraceus, dorso toto et alis extùs nigro transfasciatis; cervice posticâ murino-brunneâ; pileo nigro, ochraceo brunneo transfasciato; superciliis, gulâ et abdomine medio albis; cervice imâ et pectore griseis; hypochondriis et tectricibus caudæ inferioribus cervinis nigro transfasciatis; rostro corneo, mandibulæ basi flavicante, pedibus flavis: long. tota 12, *alæ* 6·2, *caudæ* 2·1, *tarsi* 2·9, *rostri a rictu* 1·5.

Hab. Santa Rosa, Ecuador (*Steere*).

Obs. *C. variegato* et *C. bartletti* forsan affinis, sed staturâ majore et pectore griseo distinguendus.

This apparently undescribed Tinamou has the back conspicuously transversely barred as in *C. variegatus*, but is much larger than that species and has the whole of the lower part of the neck brownish grey instead of cinnamon. *C. bartletti*, described by us from specimens obtained by Mr. E. Bartlett in Eastern Peru (P. Z. S. 1873, p. 311), is also a smaller bird, and has the whole under surface except the throat fawn-colour; it also wants the light supercilium and the transverse marks on the occiput. In size the new species approaches *C. sallæi*; but the totally different colour of the under surface of this species renders further comparison unnecessary.

Prof. Steere's collection contains two specimens of this species, exactly resembling one another in colour, but differing slightly in size, the bird described above being the larger of the two.

5. Note on the Anatomy of the Binturong (*Arctictis binturong*). By A. H. Garrod, M.A., F.R.S.

[Received January 7, 1878.]

In an earlier communication [1] I was able to confirm the observations of others, and to add fresh details, with reference to the anatomy of *Arctictis binturong*. Since that paper was published, two other specimens of the species have passed through my hands, the earlier of which differed in no respect from the one which I had previouly described. The last, however, which died on January 4, 1878, presented a peculiarity which I feel to be deserving of record. It was a female, apparently adult, having lived in the Gardens of the Society since October 19, 1875. The abnormal feature which it presented was the total absence of any trace of the colic cæcum, which, as is shown in a drawing accompanying my former paper, is normally extremely small.

The line of separation between the small and large intestines is well defined; and there is no valvular constriction between the two tubes, as is the case in the Arctoidea generally. There is a large Peyer's Patch quite close to the termination of the smaller gut.

The non-constancy of the presence of the diminutive cæcum in *Arctictis binturong*, and its total absence in *Nandinia binotata*[2], makes it evident that the existence of the cæcum is a less important diagnostic character than was inferred by earlier investigators.

[1] P. Z. S. 1873, p. 196.

[2] *Vide* Prof. Flower's "Note," P. Z. S. 1872, p. 683.

6. Notes on the Anatomy of Passerine Birds. Part IV.

By A. H. Garrod, M.A., F.R.S.

[Received January 7, 1878.]

In my "Notes on the Anatomy of Passerine Birds," Part II., whilst discussing the systematic position of the Eurylæmidæ, I mention that the method of insertion of the tensor patagii brevis muscle of the arm is unknown[1]. Through the kindness of Lieut.-Colonel Godwin-Austen, who has placed at my disposal carbolized specimens of *Psarisomus dalhousiæ* and *Serilophus rubropygius*, I have recently had the opportunity of dissecting these species, and am now able to state that in both of them the tendon of the tensor patagii brevis is perfectly passerine, agreeing precisely with the typical arrangement previously described by me in the Order[2]—the two tendons which traverse the distance between the point where the main tendon joins the extensor metacarpi radialis longus and the elbow running independently and parallel as they course to their humeral attachment.

In neither specimen was I able to dissect out the plantar tendons, because they were so dry and brittle that no amount of soaking would render them fit for observation. I was, however, able to determine some other anatomical points, including the existence of a single carotid artery (the left), a normal disposition of the vessels of the thigh (the main artery of the leg being the sciatic), the considerable size of the femoro-caudal, of the semitendinosus, and of the accessory semitendinosus, and the absence of the accessory femoro-caudal and of the ambiens muscles.

Previous evisceration, I regret to say, prevents my adding any thing with reference to the syrinx and the abdominal viscera; nevertheless I think that now the vomer and the tensor patagii brevis are known to conform exactly with the Passerine type, all shadow of doubt as to the perfectly Passerine structure of the Eurylæmidæ may be dismissed, notwithstanding the aberrant vinculum joining their deep flexor tendons.

So far as its sternum is concerned, *Psarisomus dalhousiæ* so closely resembles *Eurylæmus javanicus*, as figured by Mr. Sclater in 'The Ibis'[3], that no further remark with reference to it is necessary, except to draw attention to the unforked condition of the manubrium. My specimen of *Serilophus* was too much shot for me to make out its sternal peculiarities.

[1] P. Z. S. 1877, p. 449.
[2] P. Z. S. 1876, p. 508.
[3] Third Series, vol ii., 1872, p. 179.

7. Descriptions of new Species of Phytophagous Coleoptera. By Martin Jacoby.

[Received January 10, 1878.]

Family Eumolpidæ.

Genus Chalcophana.

1. Chalcophana rufipennis, sp. nov.

Above, shining bright rufous; below, black; legs testaceous; head with a median depression, impunctate, labrum and antennæ light testaceous; thorax finely and very sparingly punctate, together with the head rufous; elytra of the same colour, distinctly and regularly punctate-striate on the disk, more irregular towards the sides, where also three distinct ribs or costæ are visible running parallel to each other. Underside black, with a metallic green tint; legs and tarsi yellowish or testaceous.

Length 4 lines.

Hab. Costa Rica.

Collected by Mr. Rogers.

This species is closely allied to *C. discolor* of v. Harold, but differs abundantly in the coloration of the antennæ, the underside, and legs.

2. Chalcophana costatipennis, sp. nov.

Upper and underside rufous testaceous; antennæ black, the basal three joints ferruginous; femora red; tibiæ and tarsi black; head minutely punctured, with a fovea between the eyes; thorax with a few minute punctures; scutellum smooth; elytra each with about seven distinct costæ, all of which, with the exception of the fifth and sixth, commence below the transverse and deeply marked basal depression; the fourth, fifth, and sixth costæ united at a little distance from the apex; the interstices deeply punctate, the punctures united in pairs.

Length, 3 to 3½ lines.

Hab. Chontales, Nicaragua.

This species, although closely allied to *C. discolor*, Harold, and *C. rufipennis* above described, is distinguished from both by the strongly raised costæ on the entire disk of the elytra and by the entirely black tibiæ.

Genus Colaspoides, Castelnau.

3. Colaspoides viridicollis, sp. nov.

Oblong-ovate, convex, fulvous above; head, thorax, and a broad margin round the elytra bright metallic green; head sparingly but deeply punctate, with a deep longitudinal groove; antennæ with the first six joints, the labrum, and palpi fulvous, the last four joints of the antennæ much depressed and widened, of a fuscous colour; thorax with the anterior and posterior margin gradually produced in the middle, the sides evenly rounded, with a shallow but distinct

oblique depression at a little distance from the anterior angles, surface distantly but distinctly punctate; scutellum smooth, metallic green. Elytra scarcely wider at the base than the thorax, evenly rounded towards the apex, finely punctate-striate, the interstices plane; the entire lateral margin, with the apex to a greater extent, is of a bright, shining, metallic green, while the rest of the surface is of a light fulvous colour, where the punctures are also surrounded by a piceous spot. Underside (with the exception of the thorax and part of the breast) and legs entirely fulvous.

Length 2 to 2½ lines.

Hab. Amazons.

Collection Jacoby.

Family CHRYSOMELIDÆ.

Genus DORYPHORA.

4. DORYPHORA FLAVOGUTTATA, sp. nov.

Ovate, convex, above dark brown with a slightly greenish tint, each elytron with three fulvous spots; head greenish black, sparingly but distinctly punctured, the punctures on the clypeus more strongly marked; antennæ black, with the underside of the first joint testaceous, as well as the apex of the last joint; thorax with the middle of the anterior margin nearly straight, the lateral margins a little thickened and evenly rounded anteriorly, surface but little shining, of the same colour as the head, deeply punctate, more closely so towards the sides; scutellum triangular, smooth; elytra much wider than the base of the thorax, convex till their middle, but rather suddenly declining towards the apex, surface punctured in the same way as the thorax, and partly arranged in double lines of striæ, each elytron with an oval patch near the scutellum, a transverse one in the middle, and another smaller near the apex, the latter spot sometimes obsolete, of a reddish fulvous colour. Underside and legs greenish, shining; the mesosternal process straight and very acute.

Length 5 lines.

Hab. Volcano of Irazu, Costa Rica.

5. DORYPHORA PUNCTIPENNIS, sp. nov.

Oblong, convex, above brown; base, lateral margins, a transverse vitta, and a subsutural stripe near the apex, of the elytra, flavous; head light brown, with a slight greenish reflection, moderately close and distinctly punctured, labrum lighter-coloured; antennæ larger than the thorax, with the first five joints shining brownish green, the basal joint testaceous below, the rest blackish, hairy; thorax narrowed at the base, from there diverging to the apex, the anterior angles acutely produced, of the same colour as the head, very deeply and coarsely punctate towards the sides, on the disk a little less closely, and leaving a longitudinal middle line smooth; scutellum impunctate; elytra much wider at the base than the thorax, closely variolose-punctate, the punctures arranged in striæ towards the suture, and everywhere distinctly visible to the naked eye, of the

same colour as the head and thorax, shining, the base and the lateral margins (with the exception of a small space a little before the middle, where the margin is interrupted by a brownish black spot, which also extends across the elytral seam below), a transverse vitta from one side to the other, and a short streak running from the apex parallel with the suture flavous. Underside brownish black.

Length 5½ lines.

Hab. Volcano of Irazu, Costa Rica.

Collected by Mr. Rogers.

6. DORYPHORA FLAVOMARGINATA, sp. nov.

Oblong-ovate, subdepressed, greenish or brownish; head, lateral margin of thorax broadly, elytral one narrowly testaceous; head and mouth testaceous, the former closely punctate in front of the eyes, nearly smooth in the middle, with a greenish V-shaped mark; antennæ reaching to the base of the thorax, with the first four joints testaceous, the rest more or less stained with greenish black; thorax with the front margin slightly convex in middle, and the sides evenly rounded, surface closely and distinctly punctured at the base only, the rest sparingly and very minutely; a subquadrate greenish black patch narrowed towards its base occupies the middle of the disk, leaving the sides testaceous; scutellum flavous, more or less stained with fuscous, smooth; elytra very little wider at the base than the thorax, semiflattened, of a greenish or brownish tint, irregularly and rather closely punctate-striate, with fine transverse and longitudinal scratches, the lateral margin from the shoulder to the apex testaceous, only punctured near the inner edge, the outer half perfectly smooth with the exception of a single row of rather deep punctures near the extreme margin. Body below, with the exception of the mesosternal process, the tibiæ externally, and the margins of the abdominal segments (the latter of which are testaceous) fuscous, shining.

Length 4½ lines.

Hab. Peru.

Collection Jacoby.

7. DORYPHORA DORSOMACULATA, sp. nov.

Ovate, regularly convex, dark fuscous; elytra light green, with a pear-shaped sutural patch, fuscous; head very finely punctate, fuscous, labrum flavous, antennæ with the first joint light, the rest darker brown; lateral margins of the thorax rounded throughout, slightly sinuate in middle, more dispersedly but not coarser-punctured than the head, and of the same colour; scutellum subtriangular, impunctate; elytra strongly punctate-striate (visibly to the naked eye), the striæ arranged in single rows, of which the first is short and the seventh disturbed by a few extra punctures near its middle; the interstices also extremely finely punctate, of a light olive-green colour, with the suture narrowly, the lateral margins more distinctly, part of the extreme base, and, connected with it, a common sutural

pear-shaped patch extending to nearly the middle of the length of the elytra, fuscous brown; a narrow light-flavous stripe accompanies the marginal and sutural one through its entire length. Entire underside and legs fuscous brown.

Length 5 lines.

This species was discovered by Mr. Rippon in Nicaragua.

8. DORYPHORA INSULARIS, sp. nov.

Ovate, regularly convex, above greenish black, with a submarginal broad longitudinal vitta light testaceous; head sparingly and finely punctate, labrum fulvous; antennæ rather long, the last five joints flattened and broad, of a greenish black colour; thorax of the same colour, throughout finely punctured with seven or eight deep punctures parallel with the extreme lateral margin; scutellum smooth, triangular; elytra slightly wider at the base than the thorax, punctate-striate towards the suture, the rest of the surface confused-punctate of a more or less dark shining green colour, interrupted only by a broad longitudinal stripe of light testaceous colour commencing a little below the shoulder and extending not quite to the apex. This stripe runs parallel with the extreme lateral margin, but has the inner margin concave a little before the middle, but nearly straight thence to the apex. Underside and legs of a little darker green, shining.

Length 6½ lines.

Hab. Peru.

Collection Jacoby.

Genus CALLIGRAPHA, Erichs.

9. CALLIGRAPHA VIOLACEO-MACULATA, sp. nov.

Oblong, convex; head and legs ferruginous; thorax and underside greenish, very shining; elytra light flavous, the suture, three transversely placed irregular spots at the posterior half, a median one at the lateral margin, and an oblique, large, bifurcate mark connected with the suture below the base, shining purplish; another short branch of the same colour is sent off from the suture below the middle of each elytron; head very sparingly and minutely punctured, with a triangular-shaped mark at the back greenish æneous; antennæ gradually thickened towards the apex, entirely ferruginous; thorax shining greenish, sides parallel at the base, rounded anteriorly, surface with a shallow fovea near each anterior margin, minutely and sparingly punctate on the disk, with a few deeper punctures near the base; scutellum triangular, the sides a little rounded, greenish black, smooth. Elytra wider at the base than the thorax, of a bright yellow hue, punctate-striate near the suture, the rest of the punctures only plainly visible within the darker markings, the suture broadly, the lateral margins narrowly, purplish; the first is greatly widened in the middle, and connected with an obliquely placed two-branched mark below the base, and another, shorter streak with an upward direction below the middle; besides

this, and two transverse markings at the apex, and placed laterally, is a distinct ⌒-shaped spot placed directly below the middle of each elytron. Legs and apex of abdomen ferrugineous.

Length 4½ lines.

Hab. Costa Rica.

Collection Jacoby.

The absence of all smaller spots usually found in the species of this genus, and the peculiar pattern of the elytral markings, as well as the purplish hue of the latter, will distinguish this species from others.

Family GALLERUCIDÆ.

Genus DIABROTICA, Chevrol.

10. DIABROTICA SEXPUNCTATA, sp. nov.

Elongate, subparallel, above dark brick-red, each elytron with three black spots; head flavous, front impressed with a short longitudinal groove, which terminates in a deep fovea, between the eyes, vertex very minutely punctured; antennæ more than half the length of the body, very light testaceous; thorax subquadrate, the lateral margins bulging out slightly before the middle, with all the angles obtuse, surface impunctate, but little convex, of a flavous colour, stained with darker irregular patches; scutellum smooth, triangular: elytra wider at the base than the thorax, and increasing in width towards the apex, distinctly margined at the sides, and closely punctate, the interstices here and there subrugose; they are of a brick-red colour, with a small round spot on the shoulder, another below the base near the sutural margin, and a third behind the middle black. Underside blackish, finely yellowish-pubescent; tibiæ testaceous; claws darker.

Length 5 lines.

Hab. Volcano of Irazu, Costa Rica.

This insect closely resembles in colouring the *D. tripunctata* of Oliv., but differs in the want of the impression on the thorax, besides the different shape of the elytral spots.

11. DIABROTICA VENTRICOSA, sp. nov.

Elongate-ovate, very convex and widened posteriorly, black; head and thorax ferrugineous; elytra with two basal spots, a transverse band in middle and another at the extreme apex flavous; head finely punctate, with two crescent-shaped elevations between the antennæ; the latter very light testaceous, with the apical joints a little darker; thorax subquadrate, very convex, the posterior margin sinuate in middle, and the sides very deflexed near the posterior angles, disk obliquely foveolate on each side, finely punctured everywhere; scutellum transversely impressed near the base, black; elytra very swollen posteriorly, and much widened from before the middle, distinctly punctured, the punctuation partly arranged in striæ, especially so towards the apex, shining black; a large round spot near the scutellum, another small one directly below the humeral callus, a

transverse narrow band in the middle extending from one side to the other, and a still more narrow and shorter vitta at the apex flavous. Body beneath black; legs and tarsi testaceous.

Length 3 lines.

Hab. Panama.

12. DIABROTICA FUSCOMARGINATA, sp. nov.

Elongate, convex, light brown above; head, disk of thorax, and the elytral margin dark fuscous or black; head entirely black, impunctate, with a deep fovea between the eyes, the latter very prominent and black, base of the antennæ divided only by a sharp longitudinal ridge; palpi and antennæ entirely flavous; thorax scarcely wider than long, quadrate, distinctly emarginate at the sides, the latter slightly widened before the middle, from there straight to the base; surface very obscurely punctate, shining black or fuscous, with the lateral margins flavous; scutellum also of this colour; elytra much wider at the base than the thorax, slightly widened towards the apex, with a narrow but very distinct margin, surface closely and irregularly punctured, of a light brown colour, assuming a flavous hue towards the apex, the base to a greater or lesser extent, and a narrow stripe near the extreme lateral margins not reaching the apex, dark fuscous. Underside, with the exception of the breast (which is black), and legs entirely testaceous.

Length $4\frac{1}{2}$ lines.

Hab. Volcano of Irazu, Costa Rica.

Collected by Mr. Rogers.

13. DIABROTICA MULTIPUNCTATA, sp. nov.

Head, thorax, and a narrow sutural and lateral margin of the elytra rufous; elytra flavous, each elytron with eight small black spots; head impunctate, with a deep fovea in the middle; antennæ robust, dark rufous or fuscous; thorax transversely quadrate, disk bifoveolate, with a black spot in front of each fovea; scutellum black, impunctate; elytra subdepressed, widened behind, flavous, the spots placed as follows—one immediately below the base near the scutellum, a second one below the first but near the lateral margin, three placed transversely in the middle, a triangular-shaped spot directly below, and two others, transversely placed, at a little distance from the apex, the sutural and lateral margins rufous. Body below black, closely pubescent; femora testaceous, with a black line above; tibiæ and tarsi dark fuscous or black.

Length 3 lines.

Hab. Mexico.

Allied to *D. mexicana*, Harold, but principally differing in the rufous emargination of the elytra.

14. DIABROTICA NIGROLINEATA, sp. nov.

Elongate, light flavous; head and two longitudinal vittæ on each elytron black; head impunctate, with a deep fovea in the middle; antennæ longer than half the length of the body, with the third

joint scarcely double the length of the second, the middle joints fuscous, the first and three last joints almost white, extreme apex fuscous; thorax quadrate, obsoletely impressed on the disk, the latter impunctate, shining flavous; scutellum black; elytra irregularly and closely punctate, of a little lighter colour than the thorax, the base, suture, a submarginal longitudinal stripe from the base to the apex, and another stripe on the disk of each elytron, not reaching the apex, black. Body below and femora testaceous; breast, tibiæ, and tarsi black.

Length 3 lines.

Hab. Guatemala.

Collected by Mr. Salvin.

15. DIABROTICA VIRIDIMACULATA, sp. nov.

Above black; thorax, a round spot near the base, a transverse vitta behind the middle, the apex, and the extreme lateral margin of each elytron greenish; head black, shining, impunctate, with a deep fovea in the middle; antennæ long, filiform, with four middle joints fuscous, the others light testaceous; thorax quadrate, obsoletely impressed on the disk with two foveæ, and a smaller one near the base; scutellum obscure fuscous; elytra widened behind, narrowly margined, surface closely and finely punctate, with a short longitudinal depression near the sides, black, the margins, a large round spot occupying the apex, another smaller one below the base, and a transverse band behind the middle, not quite touching the suture, light greenish. Underside light flavous; breast, tibiæ, and tarsi fuscous.

Length 3 lines.

Hab. Cayenne.

Collection Jacoby.

16. DIABROTICA GRACILIS, sp. nov.

Oblong, green, each elytron with the base and a spot near the apex fulvous; head black, impunctate; antennæ with the second and third joints very short, equal, the first joint light green, the second to the eighth fuscous, ninth and tenth joints light flavous, and the apical one black; thorax quadrate, narrowed near the base, disk bifoveolate, bright green, obsoletely punctured; scutellum black, smooth; elytra closely punctate, a little rugose near the sides, of the same green colour as the thorax, the base in shape of a transverse band, and a large round spot near the apex, bright fulvous, the suture in the neighbourhood of the scutellum, and extending to the end of the basal vitta, narrowly edged with black. Underside green; breast, tibiæ, and tarsi black.

Length $2\frac{1}{2}$ lines.

Hab. Brazil.

17. DIABROTICA NIGROMACULATA, sp. nov.

Elongate, green; head and five markings on the elytra black; head shining, with the usual fovea in the middle; antennæ dark

ferruginous; thorax of the same shape as that of *D. gracilis*, obliquely bifoveolate, green, impunctate; scutellum black; elytra a little widened behind the middle, distinctly longitudinally sulcate below the shoulder, surface closely punctured, green, an irregular blotch on the shoulders, a small elongate, triangular sutural mark near the base and below the scutellum, and a transverse narrow spot near the apex of each elytron, not touching the margin or the suture, black. Underside and legs exactly as in *D. gracilis*.

Length 2½ lines.

Hab. Ecuador.

Two specimens, collected by Mr. Buckley, in my collection.

18. DIABROTICA VARIOLOSA, sp. nov.

Oblong, convex, widened behind, entirely dark green; head and disk of thorax dark fuscous; head impunctate, with a fovea in middle and a highly raised ridge between the antennæ; the latter with the second and third joints very short, the three basal joints light green, the following three flavous, and the rest ferruginous; thorax quadrate, rather convex, the disk with two foveæ and an indistinct transverse fuscous mark; scutellum triangular, black; elytra convex, much widened towards the apex, and coarsely and irregularly variolose and punctured, of a dark green colour. Underside pitchy black, femora green; the breast on each side covered with a longitudinal patch of golden-yellow hair, and the abdominal segments margined with long greenish hair, which also covers the legs.

Length 3 lines.

Hab. Ecuador.

One specimen in my collection.

This species is allied to *D. marginata* of Sturm, but is devoid of the brownish margin round the elytra, and is distinguished by the colour of the underside and legs as well as of the antennæ.

19. DIABROTICA PERUANA, sp. nov.

Elongate, convex, much widened behind, black beneath; thorax flavous; elytra flavous, with the base and a large spot near the apex bluish black; head impunctate, with two distinct tubercles in front of the usual middle fovea; antennæ long, filiform, entirely black; thorax subquadrate, impunctate on the disk, with two foveæ near the sides light flavous; scutellum black; elytra of the same colour as the thorax or a little lighter, with a broad band at the base, not touching the lateral margins, and a large subquadrate spot behind the middle bluish black; the punctuation on the disk very distinct and even coarse towards the base. The entire underside with the legs and tarsi black, finely covered with yellowish hair.

Length 3½ lines.

Hab. Peru.

20. DIABROTICA SEXPLAGIATA, sp. nov.

Elongate, parallel; head and thorax testaceous, the latter with a

longitudinal stripe on each side fuscous; elytra dark brown or fuscous, the lateral margins and six roundish spots, 2, 2, 2, whitish; upper part of head finely punctured, in some specimens obscure, of light brown colour, lower part light testaceous; thorax transversely quadrate, the sides rather broadly margined, surface bifoveolate, impunctate, lighter or darker testaceous, with a longitudinal black stripe near the lateral margins; scutellum testaceous; elytra closely rugose-punctate, dark fuscous, with the margins, the apex, and 6 large roundish spots, placed transversely in pairs, whitish. Underside and femora testaceous, with the tibiæ and tarsi fuscous, in one specimen entirely testaceous.

Length 2 to 2¼ lines,

Hab. Peru, Panama.

Genus CŒLOMERA, Chevrol.

21. CŒLOMERA ATRO-CÆRULEA, sp. nov.

Broadly ovate, widened posteriorly; head, thorax, and apex of abdomen rufous; elytra bluish black; antennæ and legs black; head more or less deeply and longitudinally depressed, with a narrow mesial groove through its entire length, finely punctate and flavous-pubescent; antennæ with the third joint double the length of the fourth, black, the extreme base of the first joint flavous; thorax broadly rounded at the sides, about twice as broad as long, surface deeply depressed on each side, with a longitudinal groove in the middle of the disk, throughout closely punctate, and covered with short flavous pubescence; scutellum rufous, the apex broadly rounded; elytra much widened towards the middle, distinctly marginate, the sides suddenly deflected from the shoulder, so as to form a distinct longitudinal ridge, which limits the disk of each elytron laterally to the extent of its entire length, surface extremely closely punctate-rugose. Underside dark fuscous, the last abdominal segment rufous; legs and tarsi black.

Length 4 to 4½ lines.

Hab. Peru, Panama.

Notes on previously described Species.

CRIOCERIS AUSTRALIS, Jacoby, P. Z. S. 1876, p. 807.

This species, described by me in 1876, is (as a comparison with the type in the British-Museum collection, of the existence of which I was previously not aware, has convinced me) the true *C. nigripes* of Fabricius. Lacordaire's description of that species (vol. i. p. 573), which I took as a guide, and which made me believe that the insect before me was a different species, is totally at variance with the insect of Fabricius; and my description is therefore the right one, although the name *australis* must stand as a synonym.

RHYPARIDA MADAGASCARIENSIS, P. Z. S. 1877, p. 512.

RHYPARIDA COSTATIPENNIS, P. Z. S. 1877, p. 513.



R. Müntern del et lith.

Müntern Brothers imp.

LOPHOSALEA ANAMALLAYANA

RHYPARIDA NIGRICOLLIS, P. Z. S. 1877, p. 513.

These three species, described by me under the generic name of *Rhyparida*, belong, as subsequent studies have convinced me, to the genus *Syagrus* of Chapuis.

8. Description of a new Genus of Tree-Lizards from the higher Ranges of the Anamallays. By Lieut.-Colonel R. H. BEDDOME, C.M.Z.S.

[Received January 12, 1878.]

(Plate XIV.)

LOPHOSALEA, nov. gen.

Gen. Char. No femoral pores, no lateral wings, tympanum naked; crest of the back and anterior portion of the tail very high, the lobes separate; scales of the back and sides large, irregular, imbricate, subequal in size, but mixed with a few small scales, strongly keeled, the tips directed backwards; a few trihedral or spinous scales above the tympanum; a large gular sac; tail of moderate length, very much compressed; all the scales keeled, the lower ones very prominently.

LOPHOSALEA ANAMALLAYANA, sp. nov. (Plate XIV.)

Three large scales between the base of the orbit and the top of the tympanum; the last of which is much raised and subtrihedral; a spine behind the tympanum, and another between it and the commencement of the nuchal crest; crown of head concave; the rostral shield is subvertical and over the first labial only (not horizontal and over the first and second labials as in *Salea*) a few large trihedral scales form a semicircle across the occipital region in front of the nuchal crest; seven or eight upper labials, the last very small; seven lower labials; tympanum large; eye rather small, eyelid large and scaly as in *Salea*; longitudinal series of quadrangular scales on each side of the gular sac, nuchal crest composed of two small and four large scales, the interspace between this and the dorsal crest very small and occupied by three small crest-scales; the dorsal and subcaudal crest is composed of twenty-eight large thin erect somewhat crimped scales one half an inch in length, and extends along more than one half the length of the tail. Head much narrowed in front, somewhat elongate and pointed as in *Cophotis*; the hind leg, if laid forward, only reaches the shoulder; toes with carinated transverse plates below, the third and fourth toes are very long, the fourth being a little the longer; length of body $4\frac{1}{2}$ inches, of tail $7\frac{1}{2}$ inches; colour of body fawn with irregular transverse bars of white, edged and intermixed with black, three across the body and eight across the tail, a white band along the labials and from the angle of the mouth to the shoulder; belly white.

Hab. Anamallay Mountains, 6000 feet—a very rare lizard.

This genus is allied to *Salea*, from which it differs in its gular sac; it has more the aspect of the Ceylonese *Cophotis*, from which, however, it is further removed by its naked tympanum.

9. Descriptions of new Uropeltidæ from Southern India, with Remarks on some previously-described Species. By Lieut.-Colonel R. H. Beddome, C.M.Z.S.

[Received January 12, 1878.]

Silybura nigra, n. sp.

Snout short, slightly pointed, rostral not nearly separating the nasals; eye very small, in the front part of the ocular shield, no supraorbital; scales all in nineteen rows, abdominals 180–185, caudal disk convex, not well defined, scales slightly keeled, subcaudals six to nine pairs, terminal scute of tail bicuspid; body black, very iridescent, with irregular transverse rows of yellowish-white spots, a yellowish streak commences at the fourth labial and extends along the sides for 1 to 2 inches, sides and belly more or less blotched with broad transverse patches of yellow, the first one or two inches of the belly generally uniform black.

Hab. Pulney Mountains, 4000 ft. elevation.

Silybura nitida, n. sp.

Snout obtusely pointed; rostral very small, not nearly separating the nasals; eye small, in the front part of the ocular shield; no supraorbital; fourth upper labial reddish yellow, caudal disk convex, indistinct; scales three to six; keeled terminal scute rather large, not laterally compressed, bicuspid, the points side by side, scales in seventeen rows, abdominals 188 to 194. Colour nearly jet-black, but very iridescent; the belly with very distant large reddish-yellow blotches, the black colour much predominating.

Hab. Anamallays, 4000 to 5000 ft.

Silybura petersi, n. sp.

Snout obtuse; rostral very small, not separating the nasals; tail laterally compressed, caudal disk not defined; the scales nearly quite smooth or faint traces of keels, the terminal scute shovel-shaped, not bicuspid; eye very small, in the front part of the ocular shield; no supraorbital; abdominals 155 to 158; subcaudals ten to twelve pairs; scales in seventeen rows; above uniform brown; sides with indistinct yellowish white spots or narrow transverse bars, which sometimes extend across the belly; a broad yellowish patch across the vent.

Hab. Anamallays, 4000 ft. Rare; a small species.

Silybura maculata, n. sp.

Snout obtuse; rostral very small, not separating the nasals, which are as large as the frontals; eye rather large, in the front part of the ocular shield; no supraorbital; tail laterally compressed, not well defined; caudal disk without keels, but a few of the terminal scales a little rugose, terminal scale slightly bicuspid, the points side by

side. Scales round the body in seventeen rows, abdominals about 156, subcaudals eight to thirteen pairs. Colour of a uniform brown or sometimes quite black, with several deep-red blotches along the sides of the anterior portion of the trunk and about the tail, and rarely several of these are present along the sides of the trunk.

Hab. ——?

The tail of this species is more like that of *Plectrurus* than that of *Silybura*; but I prefer to restrict *Plectrurus* to those species which have a supraorbital shield and only fifteen rows of scales.

The snake I formerly described as *Plectrurus trilineatus* has been placed by Dr. Günther in a new genus, "*Platyplectrurus*:" this has the supraorbital and only fifteen rows of scales, but it differs from *Plectrurus* proper in the presence of an elongated temporal shield over the fourth labial, besides in other points, as noted by Dr. Günther; and I think the genus may stand. *Plectrurus sanguineus* (which I find, on a reexamination of the species, has always fifteen rows of scales only round the centre of the body, not seventeen) will belong to this genus; and I have described two other species, *P. hewstoni* and *P. madurensis*.

My *Plectrurus pulneyensis* has been placed by Dr. Günther in *Rhinophis*; but it should, I think, rather be referred to *Silybura*.

My *Silybura canarica* has been referred to *Plectrurus*: it has only fifteen rows of scales (but it wants the supraorbital); the tail, however, is exactly that of the type of *Plectrurus*, with the points of the terminal scutes one above the other. It may form a distinct section in the genus, or have a new genus constituted for it. The only other *Silybura* described with fifteen rows of scales is *Silybura macrolepis* of Peters, which I have never seen, and its locality is unknown; it has evidently the typical caudal disk of *Silybura*. Dr. Günther omits all mention of this species in his synopsis of the species published in the Society's 'Proceedings' in March 1875.

I wish that I could attach the same importance as Dr. Günther does to the number of the abdominal plates; if he is correct in this, I have several new species of the ocellated *Silyburæ* like *S. ocellata*, *liura*, and *melanogaster*.

Specimens of all the species described in this paper have been sent to the British Museum.

10. On the *Larinæ* or Gulls.

By Howard Saunders, F.L.S., F.Z.S.

[Received December 31, 1877.]

A revision of the *Larinæ* is a more difficult task than that of the *Sterninæ*, the members of the present subfamily being subject to far greater variations in plumage on their passage from youth to age than is customary with the Terns. The latter, although offering differences in individual size and graduation of tint which are often extremely puzzling, may be said to have only two, or at most three, stages of plumage, viz. the immature, the winter-, and the adult

breeding-state, in the last of which the majority assume a black head or crest; but with the Gulls these conditions are more complex. Even in those species which are destitute of hood at all seasons there is a seemingly endless variation in the pattern of the primaries, the general tendency being to an increase in the lighter and a diminution in the darker portions of the webs with the advancing age of the individual—a rule which also holds good with many of those species the adults of which bear a hood in the breeding-season, whilst, on the other hand, there are others which exhibit the apparent anomaly of having a hood in the immature stage, and losing it in the adult plumage. The individual variations in size are even greater than in the Terns; and the range of the Gulls being, as a rule, less extensive, there are to be found several remarkable isolated and specialized forms, side by side with others, which are little more than climatic varieties of a general type. These circumstances have led to the establishment of a multiplicity of genera and of species, many of them exceedingly ill defined; and it was not until I had examined a considerable series of specimens here, and had visited the Museums of Paris, Leiden, Mainz, Berlin, and Copenhagen, for the purpose of identifying the types with the descriptions, that I could hope to clear up some of the more obscure questions.

The literature of this group has been rendered especially intricate through the perverted ingenuity of two systematists who have undertaken its revision. Boie and Brehm are not guiltless in the matter of genera- and species-making, but their labours were chiefly confined to sorting the European Gulls backwards and forwards into fanciful groups, and to splitting up each species into three or four, which can, for the most part, be easily referred back to their origin. But when Bonaparte and Bruch undertook the revision of the *Larinæ* of the whole world, they speedily enveloped the question in a perfect fog of synonymy, their only object being, apparently, to make as many genera and species as possible. Even distinct genera were erected for one and the same species in different plumages; the most closely allied forms were placed far apart, and widely divergent ones were united; whilst it seemed to be accepted as an axiom that a different geographical habitat was sufficient to constitute a species. Revision followed revision; and to the work of the declining days of both these authors we owe at least half of the synonymy which encumbers these pages. It was their intention to perform a similar office for the Terns; but death cut their plans short, and to this is owing the comparative simplicity of the synonymy of the *Sterninæ*.

The result of their labours appears in Bonaparte's last completed list (for that in the 'Conspectus Avium' was never finished), in the 'Comptes Rendus,' xlii. p. 770 (1856), in which he makes 68 "undoubted" species and 22 genera of *Larinæ* alone, besides 5 more species which he considered doubtful—with justice, as regards four of them, two being his own, one Bruch's, and one Wagler's, whilst the fifth, *Larus fuliginosus*, is an excellent species with which he was evidently unacquainted. To this succeeded the

reaction of common sense in the shape of one of Professor Schlegel's admirable Catalogues raisonnés of the Mus. d'Hist. Nat. des Pays-Bas, a monographical review which, in the words of Prof. Blasius, "is destined to be the foundation of all true Gull-knowledge for those whose ideas of what really constitutes a species are not sacrificed to an arbitrary whim or a geographical sport." The remarks which I have thus translated are to be found in a critical review of great merit in the J. f. Orn. (1865, p. 369, and 1866, p. 73). In this Blasius reduces Bonaparte's species to 35—a diminution which to some degree falls into the other extreme, partly owing to the fact that the author was then unacquainted with several perfectly good species, of which series have since become available, and also to his having united some closely allied forms which, in my opinion, are more conveniently treated by giving them specific rank.

As regards the North-American *Larinæ*, Dr. Elliott Coues has contributed two important reviews (Proc. Ac. Nat. Sc. Philad. 1862, p. 291, and 'Birds of the North-west' (1874); and these, coupled with the excellent Revised List of the Neotropical *Laridæ* by Messrs. Sclater and Salvin (P. Z. S. 1871, p. 564), make us better acquainted with the American species than with those of any other great division of the globe. But although there are probably no undiscovered forms, there still remain many details to be learned respecting the haunts, nidification, and various plumages of the American *Larinæ*, especially those of the Pacific-coast islands; and, indeed, there are two from the Galapagos Islands so rare that the one, *L. fuliginosus*, is only to be found in three or four collections, whilst of the other, *Xema furcatum*, only two examples are known to exist, the one in the Paris, the other in the British Museum.

With regard to several of the Old-World species there are also some important gaps to be filled up; but with one solitary exception, viz. *Rhodostethia rosea*, the least-known species and the most interesting forms are those which are found on the shores and islands of the Pacific, on both the Asiatic and American sides. These will be noticed under their respective heads; and I will now pass on to consider the genera and subgenera amongst which the species have been divided. Most of these have been based upon colour, geographical distribution, or upon the mere caprice of the systematist—upon any thing in short *except* those structural differences which afford a valid reason for their employment; but as many of these genera are either used erroneously or in a perverted sense by those who have not studied the question, I will give a full synopsis of them with remarks. Those genera which appear worthy of retention are printed in small capitals.

Genera.

Larus, Linn. Syst. Nat. i. p. 224 (1766).
For all Gulls.

Xema, Leach; J. Ross, App. ii., Ross's Voy. p. 57 (1819).
The generic characters are given as defined *by Leach*; these

are afterwards stated more fully by Stephens in Shaw's Gen. Zool. xiii. p. 176 (1825). Type and sole representative then known, *X. sabinii*. Principal characteristic, the *forked tail*.

Xema, Boie, Isis, 1822, p. 563.

For the European *hooded* Gulls; but

Xema, Boie, Isis, 1844, p. 192,

Includes all those Gulls, either with or without hoods, which he has not otherwise located under *Gavia* or *Larus*.

(N. B. *Gavia*, Moehring, 1752, Gen. Av. is prior to the 12th ed. Linn., and need not be considered; and *Gavia*, Brisson, is undefined.)

Gavia, Boie, Isis, 1822, p. 563.

No description, but is applied to two such structurally different species as *L. eburneus* and *L. tridactylus*.

Gavia, Boie, Isis, 1826, p. 980,

Is limited to *L. eburneus* only.

Gavia, Boie, Isis, 1844, p. 191,

Contains the two former and *L. audouini*.

Gavia, Kaup, Nat. Syst. Eur. Thierw. pp. 99, 196 (1829).

For *L. ridibundus* and "*L. capistratus*."

Gavia, Macgill. Man. Brit. Ornith. p. 239 (1842).

For *all* the *hooded* Gulls, including *Xema sabinii*.

Gavia, Bruch, J. f. Orn. 1853, p. 106.

For the small grey-mantled Gulls *without* hoods.

Rissa, Leach, Stephens in Shaw's Gen. Zool. xiii. pt. i. p. 180 (1825).

Type, *R. brunnichii*=*L. tridactylus*. Character—hind toe absent or rudimentary.

Cheimonea, Kaup, Nat. Syst. Eur. Thierw. pp. 84, 196 (1829).

Type, *R. tridactyla*.

Pagophila, Kaup, *op. cit.* pp. 69, 186 (1829).

Type, *Larus eburneus*.

Leucus, misprint *Lencus*, Kaup, *op. cit.* pp. 86, 196 (1829).

For *L. marinus*, *glaucus*, and *fuscus*; but

"*Leucus*, ex Kaup," Bp. Consp. Av. ii. p. 215 (1857),

Omits the black-mantled species and includes the larger grey-backed Gulls.

Hydrocolœus, Kaup, *op. cit.* pp. 113, 196 (1829).

For *L. minutus* and "*L. plumbiceps*," "Gulls with black heads and white eye-streak."

Ichthyaëtus, Kaup, *op. cit.* pp. 102, 196 (1829).

Type and sole representative, *L. ichthyaëtus*.

Laroides, Brehm, Vög. Deutschl. p. 738 (1831).

Includes most of the European hoodless Gulls.

Chroicocephalus, Eyton, Brit. Birds, p. 53 (1836).

Based upon the coloured hood, small size, and more naked tibia. The latter characteristic only holds good with regard to a limited number of hooded Gulls, and is by no means confined to them; whilst none of the other peculiarities adduced seem to be sufficient for generic distinction.

The spelling of this word has been altered to

Kroicocephalus, Jameson, Journ. Asiatic. Soc. viii. p. 243 (1839),

Chroiocephalus, Reichenbach, Nat. Syst. Vög. p. v.,

Chrœcocephalus, Strickl. Ann. Nat. Hist. p. 40 (1841),

and to

Chroocephalus, Scl. & Salv. P. Z. S. 1871, p. 576 (note)[1].

Rossia, Bonap. Comp. List B. Eur. & N. Am. p. 62 (1838).

For *L. roseus*. No description of generic character; and the name had already been employed otherwise by Owen.

RHODOSTETHIA, Macgill. Man. Brit. Orn. pt. ii. p. 252 (1842).

Type, *L. roseus*. Generic character described.

Cetosparactes, Macgill. Man. Brit. Orn. pt. ii. p. 251 (1842).

Type, *Pagophila eburnea*. Generic character described. Name altered to

Catosparactes, Gray, Gen. Birds, iii. p. 655, note (1845).

"*Plautus*, Klein," Reichenbach, Nat. Syst. Vög. Longip. p. 5 (1852).

(*N. B.* Klein's Hist. Av. Prodromus, pp. 146–148 (1750), is out of date; and his *Plautus* includes Auks, Gulls, and Petrels.)

Glaucus, Bruch, J. f. Orn. 1853, p. 101.

For the large and medium-sized *grey-mantled* species.

"*Gabianus*, Bp.," Bruch, J. f. Orn. 1853, p. 100 (description); Bonap. Naumannia, 1854, pp. 211, 215; Consp. Av. ii. p. 212 (1857) Type, *L. pacificus*.

[1] Whilst these sheets are passing through the press, Mr. H. T. Wharton ('Zoologist,' March 1878, p. 105) has pointed out the existence of an adjective, χροϊκὸς, meaning coloured; so that Eyton's error (if any) appears to have been merely the omission of the marks of diæresis over the second vowel.—H. S.

Gavina, Bp. Naum. 1854, p. 212.

For *L. canus* and allies, and *L. audouini*; but in

Gavina, Bp. Consp. Av. ii. p. 222 (1857),

the type and sole representative is *L. audouini*.

Dominicanus, Bruch, J. f. Orn. 1853, p. 100; id. *op. cit.* 1855, p. 280.

For the large dark-mantled Gulls, including the author's idea of what *L. cachinnans* of Pallas should be.

"*Leucophæus*, Bp.," Bruch, J. f. Orn. 1853, p. 108 (description).

Type and sole representative, *L. scoresbii*; but

Leucophæus, Bonap. Naumannia, 1854, p. 211,

also includes *L. heermanni*; and in

Leucophæus, Bp. Consp. Av. ii. p. 231 (1857),

are substituted for the latter *L. fuliginosus* and *L. belcheri*.

"*Blasipus*, Bp.," Bruch, J. f. Orn. 1853, p. 108 (description).

Type and sole representative, *L. modestus*, Tsch.; but

Blasipus, Bonap. Naumannia, 1854, p. 211,

also includes *L. crassirostris*, Vieill., and, in the Consp. Av., further includes *L. heermanni*.

"*Adelarus*, Bp.," Bruch, J. f. Orn. 1853, p. 106, "*Edelmöwen*."

For those species which have both a dark mantle and a hood.

Gelastes, Bonap. Naumannia, 1854, p. 212 (descr. nulla).

For *L. gelastes* and the small *unhooded* southern Gulls.

Atricilla, Bonap. Naumannia, 1854, p. 212.

For *L. atricilla* and the three other pretended species evolved from it.

Creagrus, Bonap. Naumannia, 1854, p. 213 (descript. nulla); Bruch, J. f. Orn. 1855, p. 292 (descr.).

Type, *L. furcatus*.

Gavia, Br. { Subgen. *Melagavia*, *Gavia*, *Cirrhocephala* } Bonap. Naumannia, 1854, pp. 212, 213.

For certain hooded Gulls.

Cirrhocephalus, Bruch,

For a species which had a grey hood!

Bruchigavia, Bp. Consp. Av. ii. p. 228.

A genus playfully made, because Bruch's *Gaviæ* were not the

same as the author's *Gaviæ*! Its only claim to remembrance is its adoption by Mr. W. L. Buller as a genus for a New-Zealand species.

Procellarus et *Epitelarus*, Bonap. Naumannia, 1854, pp. 211, 213.

Genus defined. Type and sole representative, *P. neglectus*, which is an immature *L. scoresbii*. This species the author had already located in the genus *Leucophæus*.

Clupeilarus, Bonap. Consp. Av. ii. p. 220 (1857).

For *L. fuscus*, *cachinnans*, and *verreauxii*. This genus has not even the merit of consistency; for it contains such different species as above, whilst it omits *L. dominicanus* (of which *L. verreauxi* is only the African form) and *L. marinus*.

Of the rejected genera one of the best is *Gabianus*, Bp., of which the sole representative, *L. pacificus*, has a remarkably deep, strong bill. But it differs in no other structural point from other typical species of *Larus*, whilst even in the form of the bill it is at times closely approached by old males of *L. dominicanus*; so that I think its adoption would be inexpedient. *Leucophæus*, Bp., has been confused between the author and Bruch until it includes species which Bonaparte himself has almost simultaneously located in two other genera; and I can see no structural difference sufficiently marked to make it desirable to employ either it or *Blasipus*, which, according to Bonaparte's latest view, includes two species differing considerably in the form of the bill. *Adelarus*, Bp., appears to be the result of an attempt to Latinize the compound word "Edelmöwen," and should rank with his *Bruchigavia* and kindred genera.

The arrangement of the species of *Larus* is matter of considerable difficulty. The plan adopted by Schlegel of dividing the Gulls into *Lari marini*, for unhooded species, and *Lari cucullati*, for those which at one time or another bear a hood, will not stand the test of later experience,—almost all of those which have a hood in their immature stage being emphatically *Sea*-gulls, as are also a few of those which have a hood in the breeding-season; whilst at least two of the unhooded species are partial to inland waters, and present, in consequence, the slight modifications of form shown by many of the hooded marsh-breeding Gulls. Under these circumstances any ascending or descending arrangement must necessarily be artificial; but I have endeavoured to group the species in the most natural manner which seemed to me to be practicable.

It may be as well to observe that by an "adult" bird I mean one which has lost the mottlings, barred tail, and other signs of immaturity; but an "old" bird is often subject to important alterations in the coloration or "pattern" of the webs of the primaries, although the general plumage may undergo no material change. The distinction between the age (in years) of the individual and the age (in months) of the primary and other feathers should also be held in

mind, to prevent confusion, although I have endeavoured to avoid any ambiguity on this point.

Genus Pagophila.

The short stout bill, coarse rough feet with serrated membranes, much excised webs, and strong curved claws appear to entitle this species to generic separation. The hallux is connected on the inside of the foot by a serrated membrane with the inner toe, a peculiarity which I do not recollect seeing noticed elsewhere. The name has been in use for nearly half a century, and is of general acceptance.

1. Pagophila eburnea (Phipps).

Larus eburneus, Phipps, Voy. N. Pole, App. p. 187 (1774); Gm. Syst. Nat. i. p. 596 (1788); Scoresby, Arct. Voy. i. p. 535 (1820) (Spitzbergen); Schl. Mus. P.-Bas, *Lari*, p. 6 (1863).

Larus candidus, Müller, Prodromus, p. viii. (1776); O. Fabr. Faun. Grœn. p. 103 (1780).

Larus niveus, Bodd. T. des Pl. Enl. p. 58, no. 994 (1783) (nec Pallas).

Larus albus, Schäff. Mus. Orn. p. 65, tab. 42 (1789).

Gavia eburneus, Boie, Isis, 1822, p. 563; Brehm, Vög. Deutsch. p. 765 (1831).

Pagophila eburnea, Kaup, Nat. Syst. eur. Th. pp. 69, 196 (1829); Gray, Gen. Birds, iii. p. 655 (1849); Newton, Ibis, 1865, p. 507 (Spitzbergen, breeding); P. Wright, Ibis, 1866, p. 217 (Polynia Island, breeding); Dresser, B. of Eur. pts. lix. lx. May 1877.

Gavia nivea, Brehm, Vög. Deutsch. p. 766 (1831).

Cetosparactes eburneus, Macgill. Man. Brit. Orn. pt. ii. p. 252 (1842); Brit. Birds, vol. v.

Larus brachytarsus, Holb. Fn. Grœnl. p. 52 (1846).

Pagophila eburneus, Bruch, J. f. Orn. 1853, p. 106.

Pagophila brachytarsa, Bruch, J. f. Orn. 1853, p. 106; Lawr. B. N. Am. p. 856 (1858); *vide* Reinht. Ibis, 1861, p. 18.

Pagophila nivea, Bp. Compt. Rend. xlii. p. 771 (1856); Consp. Av. ii. p. 230 (1857).

Larus (*Pagophila*) *eburnea*, Coues, B. N.W. Am. p. 648 (1874).

Hab. Arctic regions, from Novaya Zemlya to Baffin's Bay, and the eastern portion of Arctic America, but not as yet found in the North Pacific. Straggles down the western coast of Europe and Eastern America in winter. I can see no reason for considering Holböll's *L. brachytarsus* to be a distinct species.

Genus Rissa.

The principal characteristic assigned to this genus by Leach is the rudimentary character, or absence, of the hind toe. As this is not always constant, and as certain rare individuals from the North Pacific out of many hundreds, are occasionally to be found with a visible hind claw, and even with a nail, it has been urged by some systematists that it is not a valid genus. The

strongest evidence against it is that brought by Dr. Coues in his 'Birds of the North-West,' p. 646, where he says that whereas "a part of the Kittiwakes from the North Pacific are not distinguishable *in any way* from the North-Atlantic bird, others have the hind toe as perfectly formed and proportionately as large as in any species of *Larus*! And there is a gradation between them." He goes on to cite an extreme example from Plover Bay, with a hallux, including the nail ·2 in., with a perfect claw. Whilst writing this paper I have received, through the kindness of the authorities of the Smithsonian Institution at Washington, a similar extreme form with a hallux and nail ·2 in., the claw being well formed and curved, although the whole is certainly but small for the size of the bird, as may be seen by a comparison with a species of about the same size, *L. canus*, in which the hallux and nail measure ·5 in. Mr. O. Salvin has also lent me two specimens, both, as well as my own, from Alaska, in the one of which the nail is somewhat less developed, whilst in the other it is absent, as in the Atlantic bird. It is probable that this extreme form is both rare and local; at least I have never been able to find any but these two examples amongst the many Kittiwakes, Pacific and others, which I have examined. However, there it is; and if the genus *Rissa* depended solely upon the absence of the hind toe, it would have to be given up. There are, however, other structural characteristics, which, when united, seem to me to have weight. The *tarsus* is *remarkably short*, being only 1·2 against 1·9 in. in length of middle toe and claw, proportions unknown in any other group of Gulls; the shape of the curved bill is also peculiar; the *tail* is visibly although not deeply, *forked*; whilst these structural differences are supplemented by such minor characteristics as the peculiar livery of the immature bird, totally unlike that of the adult, or of the young of any other species, and by its exclusively crag-nesting habits. Bearing all these points in mind, I think that, although it is no longer absolutely correct to say that the genus *Rissa* depends upon the absence of the hallux, yet it is advisable to retain it as, on the whole, a valid natural division, sanctioned, moreover, by general use during upwards of half a century.

2. Rissa tridactyla (Linn.).

Larus rissa, Linn. Syst. Nat. i. p. 224 (1766); Phipps, Voy. N. Pole, App. p. 187 (1774); Leach, Syst. Cat. Brit. Mus. p. 40 (1816); Scoresby, Arct. Voy. i. p. 534 (1820).

Larus tridactylus, Linn. Syst. Nat. i. p. 224 (1766); O. Fabr. F. Grœnl. p. 98 (1780); Gm. Syst. Nat. i. p. 595 (1788); Schl. M. P.-Bas, *Lari*, p. 31 (1863); Godman, Ibis, 1872, p. 222 (Canaries).

Larus albus, P. L. S. Müller, Natursystem, p. 108 (1776) (based on Buffon's Mouette cendrée tachetée).

"*Larus cinerarius*, Linn." O. Fabr. F. Grœnl. p. 101 (1780), nec Linn. (winter-plumage, from description).

Larus riga (mispr.), Gm. Syst. Nat. i. p. 594 (1788).

Larus nævius, Schäff. Mus. Orn. p. 64 (1789).

Larus torquatus et *Larus gavia*, Pallas, Zoogr. Rosso-As. ii. pp. 328, 329 (1811).

Gavia tridactylus, Boie, Isis, 1822, p. 563.

Rissa brunnichii, Stephens, ex Leach, in Shaw's Gen. Zool. xiii. pt. i. p. 181, pl. 21 (1825), type of genus *Rissa*.

Cheimonea tridactylus, Kaup, Nat. Syst. eur. Th. pp. 84, 196 (1829), type of genus *Cheimonea*.

Laroides tridactylus, Brehm, Vög. Deutschl. p. 754 (1831).

Laroides rissa, id., *op. cit.* p. 755 (1831).

Laroides minor, id., *op. cit.* p. 756 (1831).

Rissa cinerea, Eyton, Cat. Brit. B. p. 52 (1836).

Rissa tridactyla, Macgill. Man. Brit. B. ii. p. 249 (1842); Hist. Brit. B. v. p. 515; Gray, Gen. Birds, iii. p. 655 (1849); Bruch, J. f. Orn. p. 103 (1853); Bp. Consp. Av. ii. p. 225 (1857).

"*Rissa brachyrhynchus* (Gould)," Bruch, J. f. Orn. 1853, p. 103, nec Gould.

Rissa borealis et *gregaria*, Brehm, Naum. 1855, p. 294.

"*Rissa niveus* (Pall.)," Bruch, J. f. Orn. 1855, p. 285, nec Pallas.

Rissa kotzebui, Bp. Consp. Av. ii. p. 226 (1857).

Larus (*Rissa*) *tridactylus*, Coues, B. N.W. Am. p. 644 (1874).

Larus tridactylus, var. *kotzebui* (Bp.), ibid. p. 646 (1874).

Hab. Arctic region, and along the sea-coasts of the subarctic region, down to about 40° N. lat., breeding perhaps even in the Canaries (*Godman*); in winter it is abundant about the Azores, Canaries, and opposite coast of Africa. In America it is found on both Atlantic and Pacific coasts, but does not seem to extend far down the latter, nor to Japan or China even in winter.

In treating of the genus, I have already noticed that examples are occasionally found about Alaska and the Aleutian Islands with a minute but tolerably developed hind toe, and, at times, with a visible nail, a variation which is rare and *not always equal in extent, even on both feet of the same individual*. I have therefore treated var. *kotzebui* as a synonym, there being no other difference between this and the ordinary Kittiwake, and a gradation between them existing.

3. Rissa brevirostris, Brandt.

Larus brachyrhynchus, Gould, P. Z. S. 1843, p. 106; Zool. Voy. of "Sulphur," p. 50, pl. 34 (1844), nec Richardson (1831).

"*Rissa nivea* (Pall.)," Gray, Gen. Birds, iii. p. 655 (1849), nec Pallas; Lawr. B. N. Am. p. 855; Elliot, B. N. Am. pl. 54.

"*Rissa brevirostris*, Brandt," Bruch, J. f. Orn. 1853, p. 103; id. 1855, p. 285; Dall and Bann. Tr. Chic. Ac. i. 1869, p. 305.

"*Gavina citrirostris*, Schimper," Bruch, J. f. Orn. 1855, p. 284 (Kamtschatka).

Rissa brachyrhyncha, Bp. Consp. Av. ii. p. 226 (1857); Coues, P. Ac. N. Sc. Philad. 1862, p. 306.

Larus warnecki, Coinde, Rev. et M. Zool. 1860, p. 401 (Aleutian Islands).

Larus brevirostris, Coues, Key Am. B. p. 315 (1872); Elliot's Prybilov Is. Birds, no. 553.

Larus (*Rissa*) *brevirostris*, Brandt; Coues, B. N.W. Am. p. 646 (1874).

Hab. The North Pacific, between Alaska and Kamtschatka, where it is very abundant, breeding in thousands on the Prybilov Islands.

This is a very distinct species, and may at once be recognized by its very short stout bill, *orange-red legs and feet*, and dark mantle; the ground-colour of the primaries is also dark grey. I am indebted to the liberality of the authorities of the Smithsonian Institution for a fine specimen of this species, which is as yet rare in collections.

A variation in the hind toe and nail, similar to that in *R. tridactyla*, although in a smaller degree, is observable in this species. My own specimen has no claw on the right hind toe, and only a minute black speck on the left; of two others, from Alaska (e Mus. Salvin & Godman), the one has no hind nail whatever, whilst the other has small black nails, unequal in size, on both hind toes.

Genus Larus.

4. Larus glaucus, Fabr.

Larus glaucus, O. Fabricius, Faun. Grœnl. p. 100 (1780, ex Brünn.); Gm. Syst. Nat. i. p. 600 (1788); Scoresby, Arct. Voy. i. p. 535 (1820); Middendorff, Sib. Reise, ii. p. 241 (1853); Newton, Ibis, 1865, p. 509; Schlegel, Mus. P.-Bas, *Lari*, p. 4 (1863); Coues, B. N.W. Am. p. 620 (1874); Swinhoe, Ibis, 1874, p. 165 (Japan); Seebohm & H. Brown, Ibis, 1876, p. 453 (Lower Petchora); Dresser, B. of Europe, pts. lix., lx. (1877).

"*Larus giganteus*, Temm," Benicke, Ann. Wetterau. Gesellsch. iii. p. 140 (1814).

Larus leuceretes, Schleep, N. Ann. Wetterau. G. i. p. 314 (1819).

Larus consul, Boie, Wiedemann's Zool. Mag. p. 126.

Larus islandicus, Edmonst. Mem. Wern. Soc. iv. (1822) p. 185 (nec Edmonst. *op. cit.* p. 506 = *L. leucopterus*).

Larus glacialis, Macgill. Mem. Wern. Soc. v. pl. i. p. 270 (1824).

Leucus glaucus, Kaup, Natürl. Syst. p. 86 (1829).

"*Larus glacialis*, Benicke," Brehm, Vög. Deutschl. p. 732 (1831).

Larus hutchinsii, Richards. F. Bor.-Am. ii. p. 419, note (1831); Cassin, P. Philad. Ac. 1862, p. 290; Coues, ibid. p. 294; Elliot, B. N. Am. ii. pl. 53; Dall. & Bann. Tr. Chic. Ac. p. 304 (1869).

Plautus glaucus, Reich. Nat. Syst. Av. Longip. p. 5 (1852); Ic. Av. pl 47. fig. 316–318, pl. 50. fig. 2640.

Glaucus consul (Boie), Bruch, J. f. Orn. 1855, p. 101.

Laroides glaucus, Bruch, J. f. Orn. 1855, p. 281.

Hab. Arctic regions; seldom breeding much to the south of the arctic circle. In winter it goes southwards, and has been known to straggle as far as the Mediterranean, to Long Island on the Atlantic coast of America, also on to the coasts of Japan, whence I have seen specimens obtained at Hakodadi by Capt. Blakiston.

L. hutchinsii I consider to be an immature *L. glaucus* in the stage where the mottled brown of immature plumage has passed away, and the pearl-grey mantle has not yet begun to show. This stage lasts but a short time, which will account for the fact that this supposed species has so rarely been obtained; but I have always observed in young specimens in captivity that at this stage they are nearly, and sometimes quite, white. A fine example in this state, obtained off Japan by Capt. St. John, H.M.S. 'Sylvia,' is in the Marquis of Tweeddale's collection. Mr. Collett obtained one in Norway in September 1871; and several have been recorded from America.

The feet and legs in adults of this Gull are *bright flesh-pink*, and not lemon-yellow as depicted by an extraordinary freak of the colourist in Mr. Dresser's 'Birds of Europe.'

5. LARUS LEUCOPTERUS, Faber.

Larus argentatus, E. Sabine, Tr. Linn. Soc. xii. p. 546 (nec auctt.).

Larus leucopterus, Faber, Prod. Isl. Orn. p. 91 (1822); Sw. & Rich. F. Bor.-Am. ii. p. 418 (1831); Schl. Mus. P.-Bas, *Lari*, p. 5 (1863); Dall. & Bann. Tr. Chic. Ac. i. 1869, p. 304 (Alaska and Lower Yukon); Coues, B. N.W. Am. p. 622 (1874); Dresser, B. of Europe, pt. xlix (1876).

"*Larus glaucoides*, Temm." Meyer, Taschenb. iii. p. 197 (1822); Boie, Isis, 1822, p. 562.

Larus glaucoides, Temm. Pl. Col. 77^e^ livr. Introd. *Larus* (1828).

Larus islandicus, Edmonst. Mem. Wern. Soc. iv. p. 506 (1823) (nec Edmonst. *op. cit.* p. 185).

Larus arcticus, Macgill. Mem. Werner. Soc. v. no. xiii. p. 268 (1824) (large specimen).

Larus minor, Brehm, Vög. Deutschl. p. 736 (1831)

Laroides glaucoides, Brehm, *op. cit.* p. 744.

Laroides leucopterus, Brehm, *op. cit.* p. 745; Bruch, J. f. Orn. 1855, p. 281.

Laroides subleucopterus, Brehm, *op. cit.* p. 746.

Glaucus leucopterus, Bruch, J. f. Orn. 1853, p. 101.

Glaucus glacialis, Bruch, *op. cit.* p. 101.

Larus chalcopterus, Licht. Nomencl. Av. Mus. Berol. p. 99 (1854), sine descr. (type examined, H. S.).

? *Laroides chalcopterus* (Licht.), Bruch, J. f. Orn. 1855, p.22.

Laroides glacialis, Bruch, *op. cit.* 1855, p. 282.

Leucus chalcopterus, Bp. Consp. Av. ii. p. 216 (1857).

Leucus arcticus, Bp. *op. cit.* p. 216.

Leucus leucopterus, Bp. *op. cit.* p. 217.

Hab. Even more thoroughly arctic, during the breeding-season, than *L. glaucus*; straggling southward in winter as far as the coast of France. It is not even authenticated as breeding in Iceland or Spitzbergen; but it does so within the arctic circle from Greenland to Behring's Straits. It also breeds in Alaska; and I have examined a specimen which was obtained in Japan by Capt. Blakiston.

6. LARUS GLAUCESCENS, Licht.

Glaucus glaucescens (Licht.), Bruch, J. f. Orn. 1853, p. 101 (type examined, H. S.).

"*Glaucus glaucopterus*, Kittlitz," Bruch, J. f. Orn. 1853, p. 101.

Larus glaucopterus, Licht. Nomencl. Av. Mus. Berol. p. 99, sine descr. (1854), Behring's Straits, Chamisso (type examined, H. S.).

Laroides glaucescens, Bruch, J. f. Orn. 1855, p. 281.

Leucus glaucescens, Bp. Compt. Rend. xlii. (1856) p. 770; Consp. Av. ii. p. 216 (1857).

Larus glaucescens, Licht.; Lawr. B. N. Am. p. 842 (1858); Coues, Proc. Philad. Ac. 1862, p. 295; id. B. N.W. Am. p. 622; Swinhoe, Ibis, 1874, p. 165 (Japan).

Larus chalcopterus, Lawr. B. of N. Am. p. 843, 1860; Coues, Proc. Philad. Ac. 1862, p. 295 (nec Licht.).

Hab. Pacific coast of North America up to Behring's Straits, and, on the Asiatic side, Kamtschatka, and as far south as Hakodadi, Japan, whence I have seen a specimen obtained by Capt. Blakiston.

This apparent link between the large Gulls with white primaries and those with barred primaries may be roughly described as a Herring-Gull with the black portion of the primary-pattern nearly washed out. It is quite unmistakable. The changes of plumage in its progress to maturity show, however, that its relationship to *L. glaucus* is closer than to *L. argentatus*.

7. LARUS ARGENTATUS, Gm.

Larus fuscus, Penn. Brit. Zool. ii. p. 131 (1768), nec Linn.; Mont. Orn. Dict. i. (1802).

Larus argentatus, Gm. Syst. Nat. i. p. 600 (1788), ex Brünn.; Schl. M. P.-Bas, *Lari*, p. 16 (includes allies); Gundlach, J. f. Orn. 1857, p. 236 (Cuba); B. du Bocage, Jorn. Soc. Lisb. 1868, pp. 149, 330 (Angola); Hartlaub, Syst. Orn. W.-Afrik. p. 251 (1857), Senegal; Dresser, B. of Europe, pt. xxii. (Oct. 1873); Coues, B. N.W. Am. p. 625, 1874.

Larus marinus, var. *β*, Latham, Ind. Orn. ii. p. p. 814 (1790).

Larus glaucus, Retzius, F. Suec. i. p. 156 (1800), nec Brünn.; Meyer & W. Taschenb. ii. p. 471 (1810).

Larus cinereus, Leach, Syst. Cat. Brit. Mus. p. 40. (1816).

Larus argentatoides, Brehm, Beitr. Vögelkunde, iii. pp. 791, 799 (1822).

Larus argenteus, Macgill. Mem. Wern. Soc. v. p. 264 (1824).

"*Larus argentatoides* (Bonap.)," Sw. & Richards. F. Bor.-Am. Birds, p. 417 (1831), nec Brehm, nec Bonap.

Laroides major, *argentatus*, *argenteus*, *argentatoides*, et *argentaceus*, Brehm, Vög. Deutschl. pp. 738–743 (1831).

Glaucus argentatus, Bruch, J. f. Orn. 1853, p. 101.

Glaucus argentatoides, Bruch, *op. cit.* p. 101.

Larus marinus, Gundl. J. F. Orn. 1857, p. 236; Lembeye, Aves, de Cuba, p. 122 (1850), *cf.* Gundl. J. f. Orn. 1871, p. 291.

Larus smithsonianus, Coues, Pr. Ac. N. Sc. Philad. 1862, p. 296 (North America).

In this species the amount of white on the primaries increases with the age of the individual. Mr. Dresser (B. of Europe, xxii. *L. argentatus*, p. 3) describes an adult male from the Orkneys in summer, in my collection, as having "the outermost primary almost entirely blacki-h, white towards the tip, and crossed by a subapical black band; the next two grey at the base, black towards the tip, being finally terminated by a large white spot." This is correct, so far as any breeding bird with unspotted pearl-grey mantle may be termed *adult*; but the example in question is far from being an *old* bird. Bearing in mind that the *extreme* white tip diminishes by abrasion with the age of the *feather*, the following are the patterns of the outer primaries with the increasing age of the bird:—On the outer primary the white spot, or "mirror," absorbs the black bar till the latter wholly disappears, leaving the primary pure white from the tip to more than two inches upwards; whilst from above, a grey "wedge" along the inner web gradually eats into the black portion, reducing the width of the black along the inner web to only two inches. In the second primary a white "mirror" appears, which also increases with the age of the bird; but in this feather, so far as I have yet seen, it does not wholly absorb the black bar and unite with the white tip; what it does, however, is to eat round the black above it, so as to cut off the black from the inner web, and thus unites with the grey wedge, which has been gradually increasing its dimensions downwards. It is needless to give a minute description of the remaining primaries; it will suffice to say that, as a rule, the encroachment of the light portions upon the dark ones increases with the age of the bird, and there may easily be stages of further progression with which I am not yet acquainted. This grey "wedge" on the upper portions of the primaries should be borne in mind, as it is an important distinction between some closely allied species. These observations equally apply to the Yellow-legged Herring-Gull (*L. cachinnans*) and to the American bird which Dr. Coues formerly distinguished as *L. smithsonianus*. Dr. Coues, although he has given it up as a species, even now maintains (B. of N.W. Am. p. 628) that if a subapical spot (or "mirror") is present on the second primary of the American bird, it is small; but in two examples before me, of the correctness of whose locality I am well assured, the one from Grand Manan, in June, has it well developed, whilst in another, from Long Island, the mirror extends right across the feather, and on the inner web has nearly eaten through the black and effected a junction with the grey wedge above. Indeed only one European bird in my collection has the mirror still more developed. The average of American *may* possibly be a little larger than the average Old-World specimens; but I have not examined a sufficient series of the former to speak with the same confidence upon this point that Dr. Coues does; at any rate that difference is admittedly unworthy of specific distinction. The *mantle* in the true adult *L. argentatus* is, as every one knows, *pearl-grey*, the *legs and feet* being *flesh-coloured*; and the *ring outside the eye is of a pale yellow*. Taking

these as the characteristics to distinguish it from its congeners, its range may be defined as the north-west of Europe from the Varanger Fiord, the Baltic, the western coasts down to North Africa, the Azores (where it breeds), Madeira, and the Canaries (*Godman*). To Greenland it is a very rare straggler; but it was obtained at Winter Islands, near Melville Peninsula, occurs in Hudson's-Bay territory as far as the Mackenzie River, and probably reaches right across to the Pacific coast, where it certainly occurs, a specimen from Kodiak, collected by Wosnesensky, in the St.-Petersburg Museum, being, as Mr. Seebohm informs me, much lighter in the mantle than *L. cachinnans*; and several specimens from the west coast of Mexico are in my collection. Dall and Bannister also record what seems to be this species from Alaska and from the Upper Yukon. There can be no doubt that examples from northern latitudes have a somewhat lighter mantle than those from more temperate regions, although the transition is very gradual; and this light form has received the name of *L. argentatoides*. From Labrador this species ranges down the coast and along the great rivers and inland lakes as far as Texas; it also visits Cuba and Bermudas. Prof. Barboza du Bocage, in his "List of Birds in the Lisbon Museum" (J. f. Orn. 1876, p. 291), cites an example obtained on the Angola coast, and another at Porto Alexandre, Benguela, more than 15° *south* of the equator, and in the latitude of the island of St. Helena. This is indeed an extension of its range, provided there is no error in the identification of the specimens.

8. LARUS CACHINNANS, Pall.

Larus cachinnans, Pallas, Zoogr. Ross.-As. ii. p. 318 (1811).

Larus argentatus, Bp. Iconogr. F. Ital. Uccelli, Introd. (1832–41); Middend. Sib. Reise ii. p. 242 (part.), (1853); Schlegel, Mus. Pays-Bas, *Lari*, p. 17 (part.), 1863; Blasius, J. f. Orn. 1865, p. 380 (part.); Hume, Yarkand Exp. Zool. p. 299 (1873), Kashmir; id. Stray Feath. i. p. 270 (1873), Scinde.

Larus cachinnans, Pall.; v. der Mühle, Orn. Griechenl. p. 143 (1842).

Glaucus leucophæus, (Licht.) Bruch, J. f. Orn. 1853, p. 101 (Red Sea).

Glaucus michahellesii, Bruch, *tom. cit.* p. 101.

"*Glaucus borealis*, Brandt," Bruch, *tom. cit.* p. 101.

Laroides michahellesii, Bruch, *op. cit.* 1855, p. 282.

Laroides cachinnans, (Pall.), Bruch, *tom. cit.* p. 282.

"*Laroides borealis*, (Brandt)" Bruch, *tom. cit.* p. 282.

Larus epargyrus, Licht. Nomencl. Av. Mus. Berol. p. 99 (1854), sine descr. (type examined, H. S.).

Larus leucophæus, Licht. Nomencl. Av. Mus. Berol. p. 99 (1854), descr. nulla (type examined, H. S.); Salvadori, Cat. Uce. Sard. p. 129 (1864); Finsch & Hartl. Vög. Ost-Afrik. p. 818 (1870); Dresser, B. of Europe, pt. xxii. (Oct. 1873).

Laroides leucophæus, Bp. Naumannia, 1854, p. 212; id. Consp. ii. p. 219 (1857).

Larus fuscescens, Sclater, P. Z. S. 1867, p. 315, et Rev. List of Vert. (1872), p. 316.

? *Larus fuscescens*, Licht.; Bruch, J. f. Orn. 1853, p. 100, (part.). One of the two specimens so labelled in the Berlin Museum is of this species; the other is a *L. fuscus*.

After much consideration and the examination of a very large series of specimens from various localities, I have come to the conclusion that this form, or species, is sufficiently distinct to be treated apart from *L. argentatus*. The distinguishing characteristics of *L. cachinnans* are the *darker* mantle, *yellow* legs and feet, and the *deep orange-red* ring round the outside of the eye. These colours are naturally much more apparent in life than in dried skins; but the colour of the mantle is enough to enable any one with an ordinary perception of shades to separate the two birds at a glance. In the *pattern* of the primaries, and in the individual variations in size both are alike. With regard to the name which I have adopted, it seems to me that there cannot be the slightest doubt as to the species Pallas meant by his *Larus cachinnans* from the Caspian and the Steppes: he describes it fully; and, to avoid any ambiguity as to the shade of colour of the mantle, he uses precisely the same term that he does for the mantle of *L. ichthyaëtus*, which exactly suits this species, whilst it is too dark for *L. argentatus*, and too light for *L. affinis*. Yet more, my friend Mr. Seebohm, on his return from Siberia, examined the *Larinæ* in the St.-Petersburg Museum; and, thanks to him, I am able to state from absolute comparison that *L. cachinnans*, and *L. leucophæus* of the Mediterranean are the same, Pallas's name having the priority.

It appears, indeed, to be a form which, whether from living in a more brilliant atmosphere, or from frequenting inland seas as distinct from great oceans, or from other causes with which we are not acquainted, has acquired a greater intensity of coloration than its congener; but it is not altogether easy to indicate its precise range. The most northern example that I have examined is from Havre, an adult male, the oldest, to judge by the primaries, of any grey-backed gull in my collection; so that it appears to straggle up the French coast. It is not, however, till the Mediterranean is reached that *L. cachinnans* replaces *L. argentatus*; thence it ranges throughout that inland sea, breeding on its shores and islands; goes up the Black Sea, across the steppes and the low-lying marshy and salt-lake districts of Russia from the mouths of the Volga and the shores of the Caspian, as far as Vologda, across the Ural river and the Kirgish steppes, to the Irtich and as far as Lake Baikal. The above seems to be, roughly, its breeding-range; for Meves's description of the "*L. cachinnans*" obtained at Cholmogory on the Dwina applies better to the next species: it was so dark in the mantle that he at first took it to be *L. fuscus*. The species found in Kashmir by the Yarkand expedition was probably *L. cachinnans*. It goes down the Red Sea, and in winter visits the Persian Gulf, and the Mekran coast as far as Kurrachee. It is also found along the coasts of China and Japan in winter, and is the species recorded by Swinhoe under the

names of *L. cachinnans* and *L. occidentalis*; but his birds are most decidedly not the true *L. occidentalis* of Audubon, which has never as yet been obtained anywhere on the Asiatic shores. All Asiatic birds show very distinctly the grey wedge in the outer primaries, which *L. occidentalis* never does: besides, their mantles are not nearly dark enough for that species. I possess, or have examined, a large series of specimens from almost all the localities I have indicated, and have taken very little from descriptions; indeed it is necessary to rely in this matter on one's own observations, as the confusion respecting this group is inconceivable to any one who has not studied the question. In Japanese and Chinese specimens, all obtained in winter, my collection is especially rich, owing to the efforts of Capt. St. John, of H.M.S. 'Sylvia,' and Lieut. Stanley Muggeridge, of H.M.S. 'Kestrel;' Professor Taczanowski has sent me specimens from Lake Baikal, and Mr. W. Muloch and Mr. Blanford examples from Kurrachee and the Mekran coast, whilst as regards Russia and the Mediterranean Mr. Seebohm's and other collections have been available. I may observe that I think it quite possible that in individuals from more northern localities the feet may not be so distinctly *yellow* as in examples breeding in the Mediterranean, believing, as I do, that certain atmospheric conditions exercise a considerable effect upon coloration.

9. LARUS AFFINIS, Reinh.

Larus affinis, Reinhardt, Vidensk. Meddel. 1853, p. 78, et Ibis, 1861, p. 17 (type examined, H. S.); Seebohm and H. Brown, Ibis, 1876, p. 452.

Larus argentatus (partim), Midd. Sib. Reise, ii. p. 242. (The description of the bird from Sea of Okhotsk clearly applies to this species.)

Larus cachinnans, Licht. Nomencl. Av. Mus. Berol. p. 99, nec Pallas (specimens examined, H. S.).

Larus fuscus, Jerdon, B. of India, ii. p. 830 (1864).

Larus cachinnans, Meves, Öfv. k. Vetensk. Ak. Förh. 1871, p. 786 (Cholmogory); Heugl. Orn. N.O.-Afr. Bd. 2. Abth. ii. p. 1392 (nec Pallas).

Larus, sp.? No. 39, Heuglin (nec Pallas), Ibis, 1872, p. 65 (Novaya Zemlia and Waigats): description can only apply to this species.

Larus occidentalis, Hume, Stray Feath. 1873, p. 273 (nec Audub.).

Larus heuglini, Bree, B. Eur. 2nd ed. v. p. 58 (1876).

Professor J. Reinhardt, of Copenhagen, was the first to discriminate and to confer a name upon an individual of this species which had straggled to Greenland; but for a knowledge of its habitat and distribution we are indebted to Messrs. Seebohm and Harvie Brown, who found it breeding upon the Petchora, where, however, it only comes about 11th May, and retires southward on the approach of winter. The series of specimens brought home by these energetic naturalists threw a light upon many points which had hitherto been obscure, and showed the real position of numerous specimens from

the Red Sea and the Beloochistan coast, which had formerly been a great trouble, most of them being in immature plumage, and not suiting either *L. cachinnans* or *L. fuscus*.

Mr. Hume's description of the pattern of the primaries of the birds found in winter about Kurrachee (Stray Feathers, 1873, p. 273) shows clearly that his *L. occidentalis* is this species, and by no means the true American bird, the occurrence of which, as I have said before, has never yet been authenticated on the coasts of Asia.

Heuglin's dark-mantled bird from Novaya Zemlia is clearly *L. affinis*; and Middendorff's description of a variety of *L. argentatus* found round the southern shores of the Sea of Okhotsk also applies to this species.

It may appear strange at first sight that this species should have been first described from Greenland; but that is merely due to the unusually careful attention which the fauna of that country has received from Dr. Reinhardt, whose watchful eyes not even a straggler could escape. I have examined the type, and am satisfied that it is of this species. It connects with *L. fuscus* rather closely (although quite distinct) in the length of its foot as compared with that of the tarsus, it having a proportionally smaller foot than either *L. argentatus*, *L. cachinnans*, or *L. occidentalis*, but larger than *L. fuscus*. From the last it may also be distinguished by its larger size and the distinct "pattern" of the outer primaries, the grey wedge being quite marked in this species, whilst it is absent in the outer feather of *L. fuscus*. The mirror on the second primary is moreover only to be found in very old birds (not one of thirteen breeding-birds obtained on the Petchora had it); whilst in old *L. fuscus* this mirror is always present. The present species is in fact a Herring-Gull which passes the whole of the year in a brilliant atmosphere; and I cannot help thinking that to this, and to other conditions of existence with which we are as yet unacquainted, its intensity of coloration is mainly attributable.

10. LARUS OCCIDENTALIS, Audubon.

Larus occidentalis, Aud. Orn. Biogr. v. p. 320 (1839); Lawr. B. of N. Am. p. 845 (1858); Elliot, B. N. Am. ii. pl. lii.; Coues, P. Ac. N. S. Philad. 1862, p. 296; Schl. M. P.-Bas, *Lari*, p. 15 (1863).

Glaucus occidentalis, Bruch, J. f. Orn. 1853, p. 101.

Laroides occidentalis, id. *op. cit.* 1855, p. 282; Bp. Consp. Av. ii. p. 219 (1857).

Larus argentatus, var. *occidentalis*, Coues, Key N. Am. Birds, p. 312 (1872); id. B. of N.W. Am. p. 633 (1874).

Larus fuscus?, Saund. P. Z. S. 1875, p. 158 (Lower California).

Hab. Pacific coast of North America down to Magdalena Bay, Lower California.

It seems to me that this is a very recognizable form, and fully deserving of consideration as a species. Its nearest ally is, on the whole, *L. affinis*; but in the wing-pattern the grey wedge is absent in

the two outer primaries; and their ground-colour is rather darker than in most examples of *L. fuscus*. In the colour of the mantle many specimens are quite as dark as *L. fuscus*, especially those from Southern California, one of which I should have referred to that species but for its long coarse foot; for at that time I had only northern specimens of *L. occidentalis* available, and these are considerably lighter on the mantle and in general tint. Since then I have had the opportunity of inspecting more examples and of knowing the species better; and it seems to me that its *large deep bill* will generally, and its *large coarse foot, longer than the tarsus*, will always, suffice to separate it from *L. fuscus*, which has a delicate foot, much shorter than the tarsus. As a rule *L. occidentalis* is a stouter bird; but some males of *L. fuscus* from the south of Europe run very long in the wing and as large in the bill, whilst on the other hand the Magdalena-Bay *L. occidentalis* is a female, and has an unusually slender bill. In one example I have found a tiny sub-apical spot on the second primary on one side, but not on the other; so that it is probably a mark of extreme age; but in fully adult *L. fuscus* this is common. Although I have laid stress upon the characters which distinguish this Gull from *L. fuscus*, yet it is rather more closely related to the Herring-Gull group, as shown by its generally larger size, stout bill, and large feet, which are flesh-coloured in this species, although, as in many other cases, they are sometimes rather yellow when dried.

11. Larus fuscus, Linn.

Larus fuscus, Linn. Syst. Nat. i. p. 225 (1766); Scop. Ann. i. Hist. Nat. p. 80 (1769); Gmel. Syst. Nat. i. p. 599 (1788); Lath. Ind. Orn. p. 815 (1790); Temm. Man. d'Orn. p. 496 (1815); Schl. M. Pays-Bas, *Lari*, p. 15 (1863); Finsch & Hartl. Vög. Ost-Afr. p. 820 (1870); Sharpe and Dresser, B. of Europe, pt. xvi. (February 1873).

Larus flavipes, Meyer, Tasch. Vög. Deutschl. ii. p. 469, pl. front. (1810).

Larus cinereus, Leach, Syst. Cat. Mamm. &c., Brit. Mus. p. 401 (1816).

"*Larus argentatus*, Mont." Bewick, Brit. B. Supp. p. 39 (1821).

Leucus fuscus, Kaup, Natürl. Syst. pp. 86 and 196 (1829).

Laroides melanotos, harengorum et *fuscus*, Brehm, Vög. Deutschl. pp. 747–749 (1831).

Dominicanus fuscescens (Licht.) partim, Bruch, J. f. Orn. 1853, p. 100. Lichtenstein's example from Arabia is this species; the other bearing this name is *L. cachinnans* (specimens examined, H. S.).

Dominicanus fuscus (Linn.), Bruch, J. f. Orn. 1853, p. 100; id. *op. cit.* 1855, p. 281, including his *L. fuscescens* of 1853.

Clupeilarus fuscus, Bonap. Consp. Av. ii. p. 220 (1857).

"*Larus medius*, Hempr. & Ehr." in Mus. Berol. "Gumfudde." An immature specimen of this species, H. S.

Hab. The north of Europe, the Faroes, the Baltic, Russia as far east as Archangel, the British Islands, the French coast, and the

Canaries (probably its south-west breeding-limit, although it is known to go as far south as Senegal, whence I have examined specimens obtained in May). It visits the Portuguese and Spanish coasts, goes up the Mediterranean to the Black Sea, ascends the Nile to Nubia, and is found throughout the Nile country, whilst on the Red Sea, as far as Aden, it is stated to be sedentary (*Finsch & Hartlaub*). Jerdon's solitary immature specimen procured at Jaulna, in the Deccan, was probably *L. affinis*, the length of the wing (18 to 19 inches) being greater than that of any *L. fuscus* I ever saw, 17¼ inches being the very extreme for an old and fresh-moulted bird; and, indeed, Mr. Dresser gives only 15·7! Mr. Dresser states that Dybowski found it in Dauria; but Prof. Taczanowski, in his "Faune de la Sibérie Orientale" (Bull. Soc. Zool. de France, i.) does not mention it amongst that traveller's collection; and with regard to the quotation by the above author of Mr. Swinhoe's authority for its occurrence on the coast of China, a reference to the revised "List of the Birds of China," P. Z. S. 1871, p. 421. no. 656, shows that the species referred to ('Ibis,' 1860, p. 68) as *L. fuscus* was really *L. crassirostris*, Vieill. (*L. melanurus*, Temm.), thus considerably circumscribing the eastern range attributed to it. As regards America, Dr. Coues considers that there is no good evidence of its occurrence on the coasts of the United States.

The distinguishing characteristics of the adult of this species are its dark slate-coloured mantle, chrome-yellow legs and feet, and the shortness of the foot as compared with the tarsus. The outer primaries are very dark, and may be termed black, with a subapical patch or mirror on the first; and in *old* birds there is a *small* mirror on the second primary; but even in these there is *no sign* of the *grey wedge* on the *upper part* of the *inner web* of the *outermost*, scarcely so on the second, and but rarely even on the third—a marked difference from the *L. argentatus* group. In *L. fuscus* the inner web merely fades into a lighter shade towards the edge; and this dark ground of the primaries, and the absence of distinct "pattern," coupled with its average smaller size, and especially the smaller foot, will generally be sufficient to distinguish it from either *L. affinis* or *L. occidentalis*. But for the large coarse foot, I should have assigned a specimen of *L. occidentalis*, from Magdalena Bay, California, to this species; for at the time I had never seen so dark a form of the American bird. In shade of mantle there is much variation, some being in this respect quite as light as *L. affinis*, whilst the blackest are Egyptian specimens, in which the yellow feet are also brightest, probably due to climatic influences. These very dark birds when old have certainly a white subapical spot on the second primary, although Blasius imagined that this was confined to northern and lighter-mantled birds. The examples which run closest to *L. affinis* are some from Malaga and Tangiers, two of which I have with the subapical spot on the second primary, showing considerable age; but even with these the difference between them and *L. affinis* is very marked, *L. affinis* having the grey wedge so much more defined. The adults, therefore, are quite distinguishable; but some years ago,

before Messrs. Seebohm and Harvie Brown's explorations on the Petchora had made me acquainted with a series of *L. affinis*, I was much puzzled by Mr. W. Blanford's immature birds from the Baluchistan coast, obtained in December 1871 to January 1872, and I led him into the error of ascribing them to *L. fuscus*. By my note-book of specimens examined I find that I was in much doubt even at that time, owing to their size and the relative dimensions of the feet and tarsi; but according to my lights I could then ascribe them to nothing else. I now consider them to have been *L. affinis*.

12. LARUS CALIFORNICUS, Lawr.

? *Larus niveus*, Pall. Zoogr. Rosso-As. ii. p. 320, pl. 86 (1811), (Kamtschatka), nec Bodd. T. Pl. Enl. 994 (1783).

? *Laroides americanus*, Brehm, Vög. Deutschl. p. 743 (1831).

Larus californicus, Lawr. Ann. Lyc. New York, vi. 1854, p. 79; id. Birds N. Am. p. 846 (1858); Coues, Pr. Ac. N. S. Phil. 1862, p. 300; id. B. of N.W. Am. p. 634 (1874).

Laroides californicus, Bp. Consp. Av. ii. p. 220 (1857).

Larus delawarensis, var. *californicus*, Coues, Key N.-Am. B. p. 313 (1872).

Hab. Pacific coast of North America from Vancouver's Island to Lower California, and the interior as far as the vicinity of Great Slave Lake; also Japan coast, whence I have examined an adult specimen in the Marquis of Tweeddale's collection, obtained by Capt. St. John, H.M.S. 'Sylvia,' off Kali, Japan, in January 1872.

The name *L. niveus*, Pallas, is not available, having been previously employed by Boddaert for *Pagophila eburnea*; but I have long been of opinion that the bird described by Pallas under that name was really this species—a conviction strengthened by the sight of an undoubted example from Japan, proving that it does cross the North Pacific. It has generally been supposed to apply to a larger race of *L. canus*; but Pallas knew *L. canus* perfectly well, and he describes his *L. niveus* as a somewhat *scarce* visitor to the northern and Kamtschatkan seas, and not in the habit of going far up the rivers, also as "magnitudo corvi coracis." Now the largest *L. canus* could hardly be described as of the size of a Raven; and, except in the wing, which is proportionally long in that Gull, the other measurements are too large for it; but they exactly suit *L. californicus*, and Pallas's figure is a perfect portrait of a specimen recently sent to me through the kindness of the authorities of the Smithsonian Institution. Perhaps these remarks may assist in laying the ghost of that *Larus niveus* which for nearly a century has been haunting the lists of systematists.

Dr. Coues inserts with a ? *L. argentatoides*, Bonap. Synopsis, Ann. Lyc. Nat. Hist. New York, p. 360 (1828), as the earliest name for this species, whilst disavowing any desire to supersede Lawrence's title; but as the name had already been applied by Brehm in 1822 for *L. argentatus*, it could not be used for this species, even if correct. But Bonaparte says of his species:—"Common near New York and

Philadelphia; we have also shot it on the southern coasts of England." Now I am not aware of this species having been found within 2000 miles of New York; and the description and measurement (20 inches in length) suit *L. delawarensis*, the length of which Dr. Coues gives as 19·75 inches, better than any other. Dr. Coues goes on to identify *L. argentatoides* of Richardson with Bonaparte's species: but this cannot be; for Richardson's birds were from 23 to 25 inches in length, with a mantle of the same shade as the Iceland Gull—both too large and too light for *L. californicus*. Richardson got his bird at Melville Peninsula, and speaks of it as found at Hudson's Bay. Dr. Coues says the Smithsonian Institution possesses specimens "from localities not far distant from those of Richardson;" but it seems to me that Great Slave Lake is a very considerable distance from Melville Peninsula, although nearer to it than to New York. Dr. Coues gives the length of *L. californicus* as 20 inches; and as Richardson's 23 to 25 inches do not suit him, he quite gratuitously suggests that Richardson drew up his measurements from the largest specimens; whilst as for the colour of the legs, which are described as "flesh-coloured," whereas in *L. californicus* they are olivaceous, his assumption is that Richardson described them from dried skins! There can be very little doubt that Richardson's birds were examples of *L. argentatus*; for his measurements and descriptions suit that species better than any other.

I am glad to see that Dr. Coues, in his 'Birds of North-West America,' has reconsidered his previous hasty determination that this species was merely a large variety of *L. delawarensis*. To judge from the examples I have examined, *L. californicus*, although certainly the connecting-link between the *L. argentatus* and the *L. canus* group, is perfectly distinct from either. In the pattern of the primaries it rather goes with *L. argentatus*, in the colour of the soft parts with *L. delawarensis*; in the colour of the mantle it is much darker than either, though not so dark as *L. occidentalis*.

13. Larus delawarensis, Ord.

Larus delawarensis, Ord, Guthrie's Geogr., 2nd Am. ed., ii. p. 319 (1815) *fide* Lawr. B. N. Am. p. 846 (1858); Coues, B. of North-West Am. p. 636 (1874); Wheeler, Rep. Exp. and Surv. W. of 100th Mer. p. 485 (1876); Reid, Zoologist, 1877, p. 489 (Bermudas).

Larus canus, Bp. Specchio Comp. p. 69 (1827), nec auctt.

? "*Larus argentatoides*, Brehm," Bp. Synopsis, p. 360 (1828), nec Brehm.

Larus zonorhynchus, Richardson, F. Bor.-Am. ii. p. 421 (1831); Audubon, B. Am. viii. p. 35, pl. 446 (1839); Schlegel, Mus. P.-Bas, *Lari*, vi. p. 22 (1863); Blasius, J. f. Orn. 1865, p. 380; Bp. Consp. Av. ii. p. 224 (1857); Gundlach, J. f. Orn. 1857, p. 236 (Cuba).

Glaucus zonorhynchus (Rich.), Bruch, J. f. Orn. 1853, p. 102.

"*Glaucus occidentalis* (Audub.)," Bruch, J. f. Orn. 1853, p. 101, taf. ii. fig. 20, nec Audubon.

Gavina zonorhynchus (Richards.), Bp. Naum. 1854, p. 212; Bruch, J. f. Orn. 1855, p. 282.

Gavina bruchi, Bp. Naumann. 1854, p. 212; Bruch, J. f. Orn. 1855, p. 283.

"*Laroides occidentalis* (Audub.)," Bruch, J. f. Orn. 1855, p. 282, nec Audubon

Larus zonorhynchus, var. *mexicanus* et var. *bruchi*, Bp. Consp. Av. ii. p. 224 (1857).

Hab. Interior and coasts of North America from the Saskatchewan and Labrador to Great Salt Lake (breeding), and in winter to the middle and southern States, Cuba, and the Bermudas. An immature bird in my collection obtained by Mr. H. Whitely at Hakodadi, Japan, 14th December, 1864, seems from its size and stout barred bill to belong to this species.

The adult is easily distinguished from *L. canus* by its larger size, stout, double-zoned bill, and lighter mantle; it is smaller than *L. californicus*, its wing-pattern is different, and the mantle is much lighter.

14. LARUS CANUS, Linn.

Larus canus, Linn. Syst. Nat. i. p. 224 (1766); Gm. Syst. Nat. i. p. 596 (1788); Schl. Mus. P.-Bas. *Lari*, p. 23 (1863); Sharpe & Dresser, B. of Eur. pt. xvii. (1873); David & Oust. Ois. de la Chine, p. 517 (1877).

Larus cinereus, Scop. Ann. i. Hist. Nat. p. 80 (1769).

Larus hybernus, Gm. Syst. Nat. i. p. 596 (1788).

Larus procellosus, Bechst. Orn. Tasch. p. 373 (1802).

Larus cyanorhynchus, Meyer, Tasch. Vög. Deutschl. ii. p. 480 (1810).

Laroides procellosus et *L. canescens*, Brehm, Vög. Deutschl. pp. 750–753 (1831).

Larus canus, var. *major*, Middendorff, Sib. Reise, ii. p. 243 (1853).

Larus heinei, Homeyer, Naumannia, 1853, p. 129.

Glaucus canus, Bruch, J. f. Orn. 1853, p. 102.

"*Glaucus lacrymosus* (Licht.)," Bruch, J. f. Orn. 1853, p. 102, nec Licht.

Gavina kamtschatchensis, Bp. Naumannia, 1854, p. 212.

Gavina heinei, Bruch, J. f. Orn. 1855, p. 283.

Gavina canus, id. *op. cit.* p. 284.

? *Rissa nivea*, Bp. Cat. Parzudaki, p. 11 (1855).

"*Larus niveus*, Pall," Bp. Consp. Av. ii. p. 224 (1857); Swinhoe, P. Z. S. 1871, p. 420; David & Oust. Ois. de la Chine, p. 518, 1877, nec Pallas.

Larus delawarensis, Coues, Pr. Ac. N. Sc. Phil. 1861, p. 246.

Larus canus major, Schl. Mus. P.-Bas, *Lari*, p. 26 (1863).

"*Larus suckleyi*, Lawr." Schl. M. P.-Bas, *Lari*, p. 27 (1863), nec Lawr. (Japan).

Larus audouini, Tristram, Ibis, 1868, p. 330, nec Payr.

Hab. Throughout the Palæarctic region, but very rare in Iceland; once in Labrador.

A specimen bearing the label of the Labrador Expedition of Dr. E. Coues and Mr. J. W. Dodge in 1860, obtained at Henley Harbour on the 21st August, and marked *L. delawarensis*, came into my hands indirectly from Mr. Krider, of Philadelphia. I have very little doubt as to its being really *L. canus*; but the American naturalists will have an opportunity of disputing or confirming my view, as I have sent it to the Smithsonian Institution.

Few species differ so much in individual size as *L. canus*; and I cannot admit the specific validity of the large race found throughout Northern Russia and Siberia. Off Japan all sizes are found; and the colour of the mantle is also very variable, being lightest in Scotch breeding-birds. It appears to be a species which attains its greatest development in the north and east, and deteriorates in size as it ranges south and west. I have already pointed out that I consider *L. niveus* of Pallas to be really the earliest name of *L. californicus*, Lawr.

15. LARUS BRACHYRHYNCHUS, Rich.

Larus canus, Richardson, F. Bor.-Am. ii. p. 420 (1831), nec Linn. nec auctt. (adult).

Larus brachyrhynchus, Rich. F. Bor.-Am. ii. p. 421 (1831), juv. (nec Gould, P. Z. S. 1843), type described, Great Bear Lake, May 23rd, 1826; Coues, P. Ac. N. S. Philad. 1862, p. 302; Elliot, B. N. Am. ii. pl. 53; Dall & Bann. Tr. Ch. Ac. 1869, p. 305.

Larus suckleyi, Lawr. Ann. Lyc. New York, 1854, p. 264; id. B. N. Am. p. 847 (1858); Schl. M. P.-Bas, *Lari*, p. 27 (1863).

Rissa septentrionalis, Lawr. Ann. Lyc. New York, 1854, p. 266; id. B. N. Am. p. 854 (1858).

Larus canus, var. *brachyrhynchus*, Coues, Key N. Am. B. p. 313 (1872); id. B. N. W. Am. p. 638 (1874).

Hab. North-Pacific coast of America, from Sitka downwards, and the interior to Great Bear Lake.

I can refer to no other species the specimens obtained by the late Mr. Hepburn at San Mateo, California, and one very old and fresh-moulted bird in the Copenhagen Museum from Sitka. They are certainly not *L. delawarensis*; and they are smaller than any *L. canus* in my collection except one, a quite abnormally small female from Orkney. The bill is slender and weak; and the foot with the middle toe and nail is nearly as long as the tarsus, which in *L. canus* is considerably longer. The bill is olive-green to mandible, in front of which it is yellow, the former colour being much more predominant than in old *L. canus*. There is much more grey from the base of the primaries downwards than in *L. canus*; and on the third primary the wedge descends to the level of the tip of the fifth primary, whilst there is a broad subapical mirror on the third primary, which, again, is seldom, if ever, the case in *L. canus*; also the ends of the primaries are much more broadly tipped with white.

So far, I think, I am in accord with Dr. Coues, who has had the advantage of examining Richardson's type, which, however, is a young bird; but as regards the adult, of which he has seen far more

examples than I have, there is a slight discrepancy to be explained. He says that the colour of the mantle of *L. brachyrhynchus* is rather *lighter* than in *L. canus*; my specimens are certainly rather *darker* than the darkest *L. canus*. Perhaps this is a slip of the pen, or an inversion of his reference; otherwise I cannot understand it. I retain this species as it has already been described, because the specimens before me have a general appearance so different from *L. canus* that they are distinguishable at a glance, although it is rather difficult to define the differences on paper; but I expect that a larger series will throw light upon the subject. Schlegel's bird from Japan assigned to this species seems to me to be merely a large *L. canus*.

16. Larus audouini, Payr.

? *Larus quadricolor*, Scop. Ann. i. Hist. Nat. p. 81. no. 109 (1769).

Larus audouini, Payraudeau, Ann. Sc. Nat. viii. p. 462 (1826); Temm. Pl. Col. livr. 81, pl. 480 (1826); Gould, B. Europe, v. pl. 438 (1837); Schl. M. P.-Bas, *Lari*, p. 22 (1863); Degl. & Gerbe, Orn. Europ. ii. p. 420 (1867); Lilford, Ibis, 1875, p. 31.

Larus payraudei, Vieill. Faun. Franç. Ois. p. 396 (1828), fide Deg. & Gerbe, *loc. cit.*

Gavia audouinii (Payr.), Boie, Isis, 1844, p. 191.

Glaucus audouini (Payr.), Bruch, J. f. Orn. 1853, p. 102.

Gavina audouini (Payr.), Bp. Naum. 1854, p. 212; Consp. Av. ii. p. 222 (1857).

Laroides audouini (Payr.), Bruch, J. f. Orn. 1855, p. 282; Brehm, Naum. 1855, p. 294.

Hab. Mediterranean, especially about Corsica and Sardinia, and the neighbouring coasts of Italy, the Balearic Islands, and North Africa. Mr. Gould quotes Natterer (*in litt.*) as having shot three specimens outside the Straits of Gibraltar, between that place and Tarifa. Lord Lilford found it breeding on the island of Toro, off Sardinia. Canon Tristram's reputed *L. audouini* from Palestine are all *L. canus*.

This Gull is one of the most unmistakable species, owing to its length of wing, dark primaries, lead-coloured or black legs, and, when adult, its cherry-red double-zoned bill. From the description given by Scopoli of his *L. quadricolor* it is probable that it is this species; but in the absence of certainty it is undesirable to use that name.

17. Larus marinus, Linn.

Larus marinus, Linn. Syst. Nat. i. p. 225 (1766); O. Fabr. Faun. Grœnl. p. 102 (1780); Meyer, Tasch. Vög. Deutschl. pl. ii. p. 465; Temm. Man. d'Orn. p. 490 (1815); Macgill. M. Wern. Soc. vol. v. p. 255 (1824); Schlegel, M. Pays-Bas, *Lari*, p. 10 (1863); Sharpe and Dresser, B. of Eur. pt. xv. (1872); Coues, B. of North-West (America), p. 624 (1874); Swinhoe, Ibis, 1874, p. 165 (Japan); Reid, Zoologist, 1877, p. 489 (Bermudas).

Larus nævius, Linn. Syst. Nat. p. 225 (1766).

Larus maculatus, Bodd. Tab. Pl. Enl. p. 16 (1783).

Larus maximus, Leach, Syst. Cat. Brit. Mus. p. 40 (1816); Brehm, Vög. Deutschl. p. 728 (1831).

Leucus marinus, Kaup, Natürl. Syst. pp. 86, 196 (1829).

Larus mülleri, Brehm, op. cit. p. 729 (1831).

Larus fabricii, id. op. cit. p. 730 (1831).

Dominicanus marinus, Bruch, J. f. Orn. 1853, p. 100; id. ib. 1855, p. 280.

Larus albus, P. L. S. Müller, Natursystem, p. 108 (1776), has generally been quoted by copyists as a synonym of this species; but investigation shows that it is based upon Buffon's "Mouette cendrée tachetée" (vol. vii. p. 424; Pl. Enl. 387), which represents a young *Rissa tridactyla*.

Hab. Northern and temperate Europe and Iceland (breeding); visiting the Mediterranean in winter, as far as Greece; the Canaries, and probably the Azores. In Northern Greenland Prof. Reinhardt assures me that it is very rare; it breeds in Labrador, occurs on the great lakes of North America, and visits Florida in winter. Lembeye's specimen, recorded from Cuba, turned out to be *L. argentatus* (vide J. f. Orn. 1871, p. 290); but it has occurred at the Bermudas (*Reid*). No record from the American side of the Pacific; but I have examined undoubted specimens from Japan collected by Capt. Blakiston. This is a very great extension of its previously known range.

18. Larus dominicanus, Licht.

Larus dominicanus, Licht. Verz. Doubl. p. 82 (1823); Darwin, Zool. "Beagle," Birds, p. 142 (1841); Cassin, Orn. U.S. Expl. Exp. p. 377 (1858), Callao?; Schlegel, M. P.-Bas, *Lari*, p. 12 (1863); Layard, B. S. Africa, p. 367 (1867); Durnford, Ibis, 1877, p. 45 (Chuput, Patagonia); id. tom. cit. p. 201 (prov. B. Ayres).

Larus littoreus, Forster, Descr. Anim. p. 46 (1844), Cape of Good Hope.

Larus antipodus, Gray, Cat. *Anseres* Brit. Mus. p. 169 (1844), New Zealand.

Dominicanus antipodus, Bruch, J. f. Orn. 1853, p. 100.

"*Dominicanus pelagicus* Anglor.," Bruch, J. f. Orn. 1853, p. 100 (India and Oceania); id. op. cit. 1855, p. 280; Bp. Consp. Av. ii. p. 214 (1857).

Dominicanus vetula, Bruch, J. f. Orn. 1853, p. 100, 1855, p. 281 (Cape Good Hope); Bp. Consp. Av. ii. 214 (1857).

"*Dominicanus vociferus* Anglor.," Bruch, J. f. Orn. 1853, p. 100, 1855, p. 281 (South America).

Dominicanus antipodum, Bruch, J. f. Orn. 1855, p. 281; Bp. Consp. Av. ii. p. 214 (1857).

Dominicanus fritzei, Bruch, J. f. Orn. 1855, p. 281 (Straits of Sunda, near Java?) (type in Wiesbaden Mus. examined, H. S.); Bp. Consp. Av. ii. p. 214 (1857).

Larus vociferus, Burm. Syst. Uebers. Th. Bras. p. 448 (1856); id. La Plata-Reise, ii. p. 518 (1861).

Clupeilarus antipodum, Bp. Compt. Rend. xlii. p. 770 (1856).
Larus verreauxii, Bp. Rev. et Mag. Zool. vii. 1855, p. 16.
Dominicanus verreauxii, Bp.; Bruch, J. f. Orn. 1855, p. 281 (Chili).
Dominicanus azaræ (Less.), Bp. Consp. Av. ii. p. 214 (1857).
Lestris antarcticus (!), Ellman, Zool. 1861, p. 7472.
Lestris fuscus, id. Zool. 1861, p. 7472.
Larus vetula, Gurney, Andersson's B. Damara Land, p. 357 (1872); Shelley, Ibis, 1875, p. 86 (Natal).

Hab. New Zealand, Kerguelen Island, and the other islands between it and Cape of Good Hope, African coast to 22° S. lat., the opposite coast of South America, the Falkland Islands, Patagonia, the coast of Chili, and the island of Juan Fernandez. I am sceptical as to the locality assigned to *L. fritzei*, whilst equally unable to accept Bonaparte's version of Sunda being a mistake for Sund [Lund?] in Sweden!

In a large series of specimens from the above localities I can detect no specific differences, individuals from the same localities often varying quite as much in the dimensions of the bill as do those from widely remote places. The absence or presence of the white mirror near the tip of the first primary is of no specific value whatever, being entirely dependent upon the age of the individual; it does not appear till after the bird has assumed the full black mantle, and increases in size with age.

The deep *brown*-black of the mantle, as distinct from the *slate*-black of *L. fuscus*, and its strong bill and larger size, will distinguish *L. dominicanus* from that species; it is smaller than *L. marinus*, has a different pattern of primaries, and has *olivaceous-coloured* legs and feet.

Messrs. Sclater and Salvin state (P. Z. S. 1871, p. 576) that the examples then living in the Society's gardens had *flesh-coloured* legs and feet; but this is either a slip of the pen, or else they must have been looking at a *L. marinus*, the only "Black-back" which when adult has those parts of that colour.

19. LARUS PACIFICUS, Latham.

Larus pacificus, Latham, Suppl. Ind. Orn. p. 68 (1801); Gould, B. of Austral. vol. vii. pl. 19; Schlegel, M. P.-Bas, *Lari*, p. 7 (1863).
Larus frontalis, Vieillot, in Nouv. Dict. H. Nat. 2nd ed. t. xxi. p. 505 (1818), im. ad. (Tasmania).
Larus leucomelas, Vieillot, N. Dict. H. Nat. 2nd ed. t. xxi. p. 509 (1818), adult (Tasmania).
Larus bathyrinchus (sic), Macgill. Mem. Wern. Soc. v. (1823–4), p. 253.
Larus georgii, King, Surv. Intertrop. Australia, ii. p. 423 (1826) (King George's Sound, S.W. Australia).
Gabianus pacificus (Lath.), Bruch, J. f. Orn. 1853, p. 100, et 1855, p. 280; Bonap. J. f. Orn. 1854, p. 211; Rev. et Mag. Zool. 1855, p. 13; Consp. Av. ii. p. 212 (1857).

Gabianus bathyrhynchus, Bruch, J. f. Orn. 1855, p. 280; Bp. Consp. Av. ii. p. 212 (1857).

Gabianus georgii (King), Bp. Consp. Av. ii. p. 213 (1857).

Hab. South-west portions of Australia, Bass's Straits, and Tasmania; not included by Mr. Buller in his 'Birds of New Zealand,' but there are three specimens labelled from that locality in the British Museum, obtained by the Antarctic Expedition.

Mr. Gould's plate hardly gives a correct idea of the dimensions and great depth of bill in this fine species, which may easily be distinguished by this feature in all stages. In the adult the tail is crossed by a black band; and this peculiarity in the plumage, coupled with the stout bill, seems to place this species midway between the typical Gulls and those of the next group. The value of *Gabianus* as a genus for this species has been already discussed.

20. LARUS BELCHERI, Vigors.

Larus belcheri, Vigors, Zool. Journ. iv. p. 358 (1829); id. Zool. Beecher's Voy. "Blossom," p. 39; Schlegel, M. P.-Bas, *Lari*, p. 9 (1863), excl. syns.; Scl. & Salv. P. Z. S. 1871, p. 575.

Adelarus belcheri, Bruch, J. f. Orn. 1853, p. 107; id. 1855, p. 279; Bp. Naum. p. 212 (1854).

Leucophæus belcheri, Bp. Consp. Av. ii. p. 232 (1857).

"*Larus fuliginosus*, Gould," Cassin, U.S. Expl. Exp. Orn. p. 378 (1858), nec Gould (Cape Horn to Callao).

Larus frobeenii, Phil. & Land. Wiegm. Archiv, 1861, p. 292.

Larus frobeni, iid. Cat. Aves Chil. An. Univ. Chil. tom. xxxi. p. 288.

Hab. West coast of S. America, from Callao southwards to Chili, the western portions of the Straits of Magellan, and down to Cape Horn.

I have the fully adult bird with pure white head and underparts from Chorillos, near Callao, Peru; but I observed the immature birds with dark hoods in far greater numbers. Although several of these Pacific Gulls have a hood in the immature stage, which is lost in the adult, in none of them is the change so remarkable as in this species. I confess that I cannot see any adequate reason for giving it generic rank; but Bonaparte thought differently, for he made it the type of his genus *Procellarus*, being quite unaware that it was absolutely the same *species* as the bird which he had already located in the genera *Leucophæus* and *Adelarus*!

Dr. Coues, in a general notice of American Gulls, under the head of *L. heermanni* (B. of N.W. p. 642), says that *L. belcheri* is "not a white-headed Gull at all," though he afterwards says that he should not be surprised if, in the adult state, it lost its hood. In this last surmise he is quite right; the adult *L. belcheri* is a perfectly white-headed Gull, at the first glance being like a stout *L. fuscus* with a black band on its tail.

21. LARUS HEERMANNI, Cassin.

Larus heermanni, Cassin, Proc. Ac. Nat. Sc. Philad. vi. p. 187

(1852); id. B. Californ. p. 28, pl. 5; Scl. & Salv. P. Z. S. 1871, p. 574; iid. Nomencl. Av. Neotrop. p. 148.

Adelarus heermanni, Bruch, J. f. Orn. 1853, p. 107, et 1855, p. 279.

Leucophæus heermanni, Bp. Naumannia, 1854, p. 211.

Blasipus heermanni, Bp. Consp. Av. ii. p. 211 (1857).

Larus (*Blasipus*) *heermanni*, Coues, B. N.W. Am. p. 641 (1874).

Hab. Pacific coast, from Vancouver's Island and California (breeding), down to Panama in winter.

The nearest ally of this species is perhaps *L. crassirostris* of the opposite Asiatic coast and islands; but its red bill and the lead-coloured neck and underparts will always serve to distinguish the adult; in *L. crassirostris* the neck and underparts are white.

22. LARUS CRASSIROSTRIS, Vieill.

Larus crassirostris, Vieill. N. Dict. H. Nat. 2nd ed. p. 508 (1819), ex Krusenstern (Nagasaki, Japan); Schlegel, M. P.-Bas, *Lari*, p. 8 (1863); Swinh. P. Z. S. 1871, p. 421; David & Oust. Ois. de la Chine, p. 518 (1877).

Larus melanurus, Temm. Pl. Col. 77me liv. pl. 459 (1828); Temm. & Schl. Faun. Japon. Aves, p. 132, pl. 88 (1850); Taczan. Bull. Soc. Zool. France, i. p. 264 (1876).

Adelarus melanurus, Bruch, J. f. Orn. 1853, p. 107, et 1855, p. 279.

Blasipus crassirostris, Bp. Naumannia, 1854, p. 211; id. Consp. Av. ii. p. 212 (1857).

Larus fuscus, Swinhoe, Ibis, 1860, p. 68 (nec Linn.).

Hab. Coasts of Japan and China, and large lakes and rivers of latter; breeding in colonies, generally on islands.

I have already pointed out roughly the distinctions between this species and *L. heermanni*; superficially the present bird is not unlike the adult of *L. belcheri*; but the mantle is much lighter, and the tail is white with a black bar, whereas in *L. belcheri* the greater portion of the tail is black.

23. LARUS MODESTUS, Tsch.

Larus modestus, Tschudi, Wiegm. Arch. 1843, pt. i. p. 389; id. Fauna Peruana, Aves, p. 306 (1845–6), pl. 35; Scl. & Salv. P. Z. S. 1871, p. 573; id. Nomencl. Av. Neotrop. p. 148 (1873).

Larus bridgesi, Fraser, P. Z. S. 1845, p. 16; id. Zool. Typ. t. 69 (1849), type in Brit. Mus.

Blasipus bridgesi (Fraser), Bruch, J. f. Orn. 1853, p. 108, et 1855, p. 280; Bp. Rev. Zool. 1855, p. 21; Consp. Av. ii. p. 212.

"*Blasipus polios* (Natt.)," Bp. Rev. Zool. 1855, p. 21; Consp. Av. ii. p. 212 (1857).

Leucophaius modestus, G. R. Gray, Hand-l. Birds, iii. p. 116 (1871).

Hab. Pacific coast of South America, from Callao to Valparaiso, and probably further south.

This species, which in its immature plumage bears an indication

of a dusky hood, has been confused with *L. fuliginosus* of the Galapagos Islands; but its much slenderer bill, tarsi, and feet will at once distinguish it from the latter, even in youth; whilst in the adult the clear grey of the underparts and the white blending into grey of the forehead and head, distinguish it from any other known species of Gull. Mr. Fraser's plate above cited gives a very fair idea of the adult; but *very old* birds are much lighter about the upper parts than his example.

24. LARUS FULIGINOSUS, Gould.

Larus fuliginosus, Gould, Zool. "Beagle," iii. p. 141 (1841); Scl. & Salv. P. Z. S. 1871, p. 573; Salvin, Trans. Zool. S. ix. p. 505, pl. lxxxvii.

Leucophæus fuliginosus et *Adelarus neptunus*, Bp. Rev. Zool. 1855, p. 20; et Consp. Av. ii. p. 232 (1857).

Procellarus heermanni! (part.), G. R. Gray, Hand-l. Birds, iii. p. 116 (1871).

Hab. Galapagos Islands.

This stoutly built and well-marked species appears to be restricted to the Galapagos group. Mr. Salvin's illustration above cited will probably prevent further confusion between this bird and *L. modestus*; but it is most extraordinary that the late Mr. G. R. Gray should have confounded it with *L. heermanni*, when he had the type of the present species before him. Specimens are exceedingly rare in collections; and of the eggs and nestlings no examples are known.

Although this species differs from the preceding ones in having a hood in its adult plumage, yet its other affinities seem to indicate that its proper place is here and not with the ordinary hooded Gulls.

25. LARUS SCORESBII, Trail.

Larus scoresbii, Trail, Mem. Wern. Soc. iv. p. 514 (1823), (New South Shetland Islands); Pelzeln, Orn. Novara Exp. p. 151; Abbott, Ibis, 1861, p. 165 (Falkland Islands).

Larus hæmatorhynchus, Vigors, in lett. King's Zool. Journ. iv p. 103 (1828–9); Jard. & Selby, Ill. Orn. ii. pl. 106; Gould, Zool. "Beagle," Birds, p. 142.

Leucophæus hæmatorhynchus, Bruch, J. f. Orn. 1853, p. 108, et 1855, p. 287; Bp. Naum. 1854, p. 211.

Procellarus neglectus, sive *Epitelarus neglectus*, Bp. Naumann. 1854, pp. 211, 213; id. Rev. et Mag. Zool. p. 13 (1855); id. Consp. Av. ii. p. 211 (1857), type and sole representative of *Procellarus*.

Leucophæus scoresbii, Bp. Consp. Av. ii. p. 231 (1857); Blasius, J. f. Orn. 1865, p. 378; Scl. & Salv. P. Z. S. 1871, p. 579; iid. Nomencl. Av. Neotrop. p. 148.

Larus scoresbyi, Schl. M. P.-Bas, *Lari*, p. 33 (1863).

Hab. Patagonia, east coast, south of about 45° S. lat., down to New South Shetland Islands, in about 63° S.; the Falkland Islands, the Straits of Magellan, and up the coast of Chili as far as Chiloe.

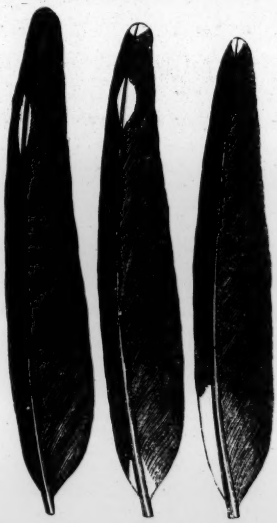
In spite of the somewhat peculiar shape of the bill in this species I hardly think it desirable to place it on that account in a distinct genus, especially as Bonaparte's genus *Leucophæus* also includes such dissimilar species as the present and *L. heermanni* of North America. His *Procellarus* is founded on a young bird of the same species! *Larus scoresbii*, however, is a very well-marked species, from its short, stout, crimson bill, and coarse legs and feet, the webs of the latter being a good deal incised. In the immature stage this bird has a sooty hood; but in the adult the upper parts are grey.

26. LARUS NOVÆ-HOLLANDIÆ, Steph. (Fig. 1.)

Larus novæ-hollandiæ, Stephens, Shaw's Gen. Zool. xiii. pt. i. p. 196 (1826), ex Latham.

Larus scopulinus, var. *major*, Forst. Descr. Anim. p. 106 (1844).

Fig. 1.



1. 2. 3.

Three outer primaries of *L. novæ-hollandiæ*, jr. (from the type of *Gavia pomarre*, Bruch, of 1853, not of 1855).

Larus jamesonii, Wilson, Ill. Zool. pl. xxiii. (1831).

Xema jamesonii, Gould, Birds of Australia, vol. vii. pl. xx (1848).

Gavia jamesonii, Wils. Bruch, J. f. Orn. 1853, p. 102; 1855, p. 285.

Gavia andersonii, Bruch, J. f. Orn. 1853, p. 102, et 1855, p. 285 (type examined, H. S.).

Gavia pomarre, Bruch, J. f. Orn. 1853, p. 103, not *Gavia pomare* of 1855, p. 285, which is *L. bulleri* (type in Mainz Mus. examined, H. S.), Society Islands.

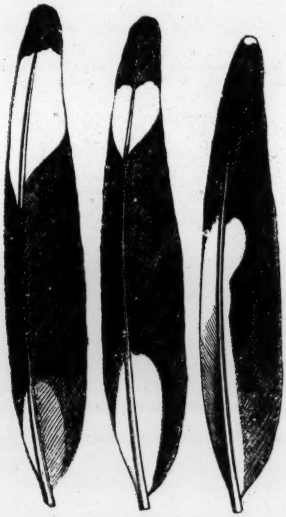
Gelastes gouldi, Bp. Naumann. 1854, p. 216.

Gelastes corallinus, Bp. Naumann. 1854, pp. 212, 216 (type in Paris M. examined, H. S.).

Gelastes andersonii, Bp. tom. cit. p. 212.

Gavia gouldii, Bp. Bruch, J. f. Orn. 1855, p. 285.

Fig. 2.



1. 2. 3.

Three outer primaries of *L. novæ-hollandiæ*, ad. (from the type of *Gavia andersonii*, Bruch).

Bruchigavia gouldi, Bp. Consp. Av. ii. p. 228 (1857).

Bruchigavia pomare, Bp. tom. cit. p. 229.

Bruchigavia jamesonii, Bp. tom. cit. p. 228 (1857); Gould, Handb. B. Austral. ii. p. 387 (1865).

Bruchigavia corallinus, Bp. op. cit. p. 228 (1857).

Larus scopulinus major, Schlegel, M. P.-Bas, *Lari*, p. 29 (1863).

Hab. Australia from Raine Island, Torres Straits, to Bass's Straits, and Tasmania; also New Caledonia, and perhaps the Society Islands.

Although very close to *L. scopulinus* of New Zealand, I think this species may fairly be distinguished by its larger size throughout, and by the greater amount of white mirror in the pattern of the three outer primaries. In old birds of *L. novæ-hollandiæ* there is always a mirror on the *third* primary as well as on the first and second; in a large series of *L. scopulinus* I have never found this. The amount of white is also greater in the Australian bird, and the shape of the mirror is different, as is shown in the accompanying figures. *L. corallinus* of Bonaparte has been supposed to be *L. maculipennis*, Licht., on the strength of the assertion in the Conspect. Av. that the type was obtained in Brazil by Castelnau. I have examined the type, which bears no indication of locality, nor do I for a moment

Fig. 3.



Three outer primaries of *L. novæ-hollandiæ*, old.

believe that it ever was killed in Brazil; it is, however, of this species, and a large-billed example.

To make matters plainer, I have had figures prepared of the three outer primaries in three different specimens of this species. In fig. 1 (p. 185) is given the pattern in a young bird, taken from a drawing by Dr. O. Finsch of the type of *Gavia pomarre* of Bruch, 1853 (but *not* his *G. pomare* of 1855, which latter = *L. bulleri*), in the Mainz Museum. Fig. 2 (p. 186) represents the primaries of Bruch's *G. andersonii*, from the same source. Fig. 3 (p. 187)

shows the pattern of an *old L. novæ-hollandiæ*, obtained in Tasmania by Capt. V. Legge, R.A., and, if compared with fig. 4 (p. 188), will show the difference between this species and *old L. scopulinus*.

27. LARUS SCOPULINUS, Forst. (Fig. 4.)

Larus scopulinus, Forster, Descr. Anim. p. 106 (1844), New Zealand; Schlegel, M. P.-Bas, *Lari*, p. 28 (1863); Finsch, J. f. Orn. 1870, p. 360; Buller, B. of N. Zeal. p. 273 (1873).

Fig. 4.



Three first primaries of *L. scopulinus*, old.

Larus novæ-hollandiæ, Gray, Voy. Ereb. & Terr. Birds, p. 18 (1844), New Zealand (nec Stephens).

Lestris scopulinus, Ellman, Zoologist, 1861, p. 7472.

Hab. New Zealand.

Under the head of the preceding species I have pointed out the differences which seem to me to separate this form from *L. novæ-hollandiæ*; but the drawing (p. 188) of the first primaries of an old bird will show the principal point of distinction better than any description.

28. LARUS HARTLAUBI (Bruch). (Fig. 5.)

Gavia hartlaubi, Bruch, J. f. Orn. 1853, 102, et 1855, p. 268, Cape G. Hope (type examined, H. S.).

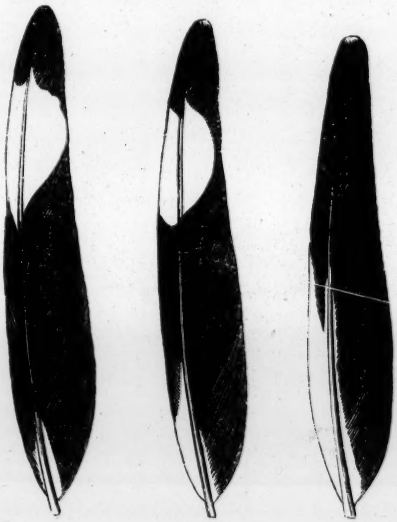
"*Larus poiocephalus*, Sw.," Layard, B. S. Africa, p. 368 (1867), nec Sw.

Larus hartlaubi, Saunders, P. Z. S. 1874, p. 293.

Hab. Southern coast of Africa, especially about Table Bay, Cape of Good Hope, where Mr. Layard obtained many specimens and also eggs, some of which he presented to me.

For a long time this species was supposed to be the winter or hoodless dress of the grey-capped *L. phæocephalus*, Sw.; but, as I have already pointed out (P. Z. S. 1874, p. 293), the present species

Fig. 5.



1. 2. 3.

Three first primaries of *L. hartlaubi*, ad.

never has a hood at all. It is quite distinct from its close allies *L. scopulinus* and *L. novæ-hollandiæ*, and may be recognized by its smaller size, proportionally longer and slenderer bill, which is of a rich crimson, and by the more sooty colour of the under wing-coverts, especially along the carpal joint. There is a small elongated mirror on the first and second primaries; but the remaining portions of those feathers are black almost to the roots. The drawing (fig. 5) shows the pattern of the primaries.

29. LARUS BULLERI, Hutton. (Figs. 6 & 7.)

Gavia pomare, Bruch, J. f. Orn. 1855, p. 285 (not of 1853, which = *L. novæ-hollandiæ*).

Bruchigavia melanorhynchus, Buller, Ibis 1869, p. 43 (nec *L. melanorhynchus*, Temm.).

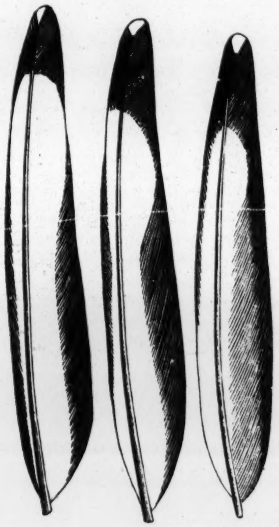
Larus (*Bruchigavia*) *melanorhynchus*, Finsch, Ibis, 1869, p. 381; Travers, Trans. N.Z. Inst. 1871, p. 209.

Larus bulleri, Hutton, Cat. Birds New Zeal. 1871, p. 41; Potts, Ibis, 1872, p. 38; Buller, B. New Zeal. p. 276, et fig.

Hab. This species appears to be restricted to New Zealand, and perhaps to the South Island.

I have examined the type of Bruch's *L. pomare* of 1855; and it is undoubtedly of this species; but the type of his *L. pomarre* of 1853

Fig. 6.



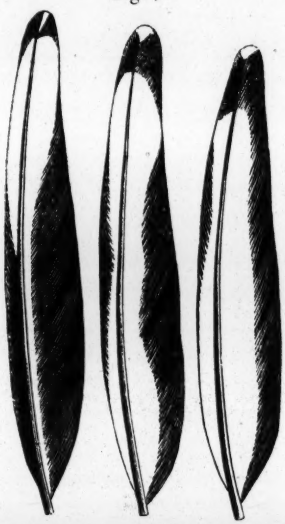
1. 2. 3.

Three outer primaries of *L. bulleri*, old, from the type.

is as certainly *L. novæ-hollandiæ*; and it is to the latter that Mr. Buller alludes as having been examined by him previous to the publication of his 'Birds of New Zealand.' The third specimen entitled *L. pomare* in the Mainz collection is a young *L. ridibundus*! Bruch's name, therefore, cannot be employed, having been previously applied to another species; and this species must stand as *Larus bulleri*,

Hutton. It is very distinct from *L. scopulinus*, and appears to frequent inland lakes and river-beds in preference to the sea-shore. The drawings (pp. 190, 191) showing the distinctive markings of the three outer primaries will be better than any description.

Fig. 7.



1. 2. 3

Three outer primaries of *L. bulleri*, nearly ad., from the type of *Gavia pomare*, Bruch, of 1855.

During my recent visit to Bremen I went into the question of this and the three preceding species with Dr. Finsch, who had previously studied the subject and had made numerous and careful drawings of the primaries of Bruch's types of *L. pomare* in the Mainz Museum, and of many other specimens. These drawings he most generously placed at my disposal; and, thanks to his liberality, I am enabled to figure the primaries of two of Bruch's types, bearing the same name, but belonging to two totally distinct species.

39. LARUS GELASTES, Licht. (Fig. 8.)

Larus gelastes, Licht. in Thienem. Fortpflanz. Vög. Eur. pt. v. p. 22 (1838), type in Berlin Mus.; Keys. & Blas. Syst. Verzeichn. Europ. Säug. p. 95 (1840); Degl. Orn. Europ. ii. p. 318 (1849); Bree, B. Eur. 2nd ed. v. p. 72 (1876); Blanford, East Persia, ii. p. 291 (Makran coast).

"*Larus leucocephalus*, Boissonneau," fide Keys. & Blas. op. cit. p. 22.

Larus genei, De Brème, Rev. Zool. ii. (1839) p. 321.
Larus tenuirostris, Temm. Man. d'Orn. 2nd ed. pt. iv. p. 478, pl. (1840); Crespon, Faune Mérid. ii. p. 126 (1844).
Xema lambruschinii, Bp. Icon. Faun. Ital. i. Ucc. p. 135, pl. (livr. xxvii. 1840).
Xema gelastes (Licht.), Boie, Isis 1844, p. 192.
Xema genei (De Brème), id. loc. cit.
Gavia gelastes, Bruch, J. f. Orn. 1853, p. 102, et 1855, p. 286.
Larus columbinus, Golowatschow, Bull. Soc. Imp. Nat. Mosc. 1854, t. i. p. 435.
"*Gelastes rubriventris* (Vieill.)," Bp. Naum. 1854, p. 216.

Fig. 8.



1. 2. 3.

Three outer primaries of *L. gelastes*, juv.

Gelastes lambruschini, Bp. Cat. Parzud. p. 11 (1855); id. Consp. Av. ii. p. 227.
Larus subroseus et *Larus brehmii*, Heugl. Syst. U. Vög. N.O.-Afr. Sitz. Ak. Wiss. Wien, 1856, p. 321; cf. Heugl. Orn. N.O.-Afr. ii. Abth., Band 2, p. 1412.
Gelastes columbinus. Bp. Consp. Av. ii. p. 227 (1857).
"*Gelastes leucocephalus*, Brisson," Bp. Consp. Av. ii. p. 227 (syn.).

Larus lambruschini, Bp., Schl. M. P.-Bas, *Lari*, p. 28 (1863); Hume, Stray Feath. i. p. 274 (1873).

Chroicocephalus gelastes, Licht. Nomencl. Av. M. Berolst. p. 98.

"*Larus arabicus*, Hemp. & Ehr.," Mus. Berolst. (fide H. S.).

Hab. South coast of Spain, the Mediterranean and Black Sea (breeding); the Red Sea, Persian Gulf, and the coasts as far as Kurrachi; also West Africa to Senegal, whence there is a specimen in the Paris Museum.

This species seems to have no very near allies. It never has a hood; yet its structure and wing-pattern remind us of *L. ridibundus*. In appearance it is like *L. scopulinus*; but its wings are very long, its bill is slender, its flight is Tern-like, and its eggs are singularly like those of *Sterna cantiaca* and *S. media*. I locate it here because I do not know of any better position for it.

31. Larus leucophthalmus, Licht.

Larus leucophthalmus, Licht.; Temm. Pl. Col. liv. 62, pl. 366 (1825); id. Man. d'Orn. 4me pt. p. 486 (1840); Heugl. Ibis, 1859, p. 349; König-Warth. Ibis, 1860, p. 129; Finsch & Hartl. Vög. Ostafr. p. 821; Finsch, Trans. Zool. Soc. vii. pt. vi. p. 302; Schl. M. P.-Bas, *Lari*, p. 32.

Iris (mispr.) *leucophthalmus*, Lesson, Tr. d'Orn. p. 618 (1831).

Xema lecophthalmum, Bp. Ucc. Eur. p. 78 (1842).

Xema leucophthalma, Gray, Brit.-M. List, Anseres, p. 171 (1844).

Adelarus leucophthalmus, Bruch, J. f. Orn. 1853, p. 106, et 1855, p. 278; Bp. Compt. Rend. xlii. p. 771 (1856); Blasius, J. f. Orn. 1865, p. 378.

Chroicocephalus leucophthalmus, Brehm, Naumannia, 1855, p. 295.

Larus masauanus, Heugl. Peterm. Geogr. Mittheil. 1861, p. 31.

Hab. Temminck states that this species visits Greece and the shores of the Bosphorus; but no recent travellers in those parts have ever met with it; and although two energetic naturalists, Dr. Krüper and M. Alléon, have for years been resident in the neighbourhood and have thoroughly explored the Greek Archipelago and the Bosphorus, they have never met with it, either there or in the Eubœan channel, which Lindermayer (Vög. Griech. p. 177) so particularly indicates. Even in the Red Sea it is, according to Von Heuglin, very scarce north of the tropic, though frequent more to the south; it does not, however, appear to go beyond the Gulf of Aden and the Somali coast; for neither Blanford nor Hume mention it as occurring along the Mekran coast; and its range is therefore much less extensive than that of the allied species *L. hemprichi*.

32. Larus hemprichi (Bp.).

Xema crassirostris (Licht.), Boie, Isis. 1844, p. 192.

Larus crassirostris, Licht. Nomencl. p. 99 (1854) (nec Vieill.), Mus. Berolst.

Adelarus hemprichii, Bp.; Bruch, J. f. Orn. 1853, p. 106 (descr.), et 1855, p. 278; Bonap. Naum. 1854, p. 212; Blasius, J. f. Orn. 1865, p. 378.

Larus hemprichi, Heugl. Ibis, 1859, p. 350; König-Warth. Ibis, 1860, p. 129 (nidif.); Schleg. Mus. P.-Bas, *Lari*, p. 32; Finsch, Trans. Zool. S. vii. pt. vi. p. 302, pl. xxvii.; Finsch & Hartl. Vög. Ostafr. p. 823; Blanford, Abyssinia, p. 441 (Red Sea); Hume, Stray Feath. i. p. 279; Blanford, East Persia, ii. p. 292 (Aden to Kurrachee harbour); Hume, Stray F. 1876, p. 414; Butler, op. cit. 1877, p. 296.

Hab. This Gull appears to have a wider range than its congener *L. leucophthalmus*, as it is not confined to the Red Sea south of the tropic, but also frequents the Persian Gulf and the coast eastward as far as Bombay. Von Heuglin and Baron König von Warthausen (*loc. cit.*) have given an excellent account of the habits and nidification of both these species; and more recently in 'Stray Feathers' Capt. Butler has given a description of the great colony on the island of Astola.

In the Bulletin de la Société Zoologique de France, 1re partie, 1877, p. 32, M. Jules Vian gives an account of two immature specimens, one of *L. leucophthalmus* and one of *L. hemprichi*, which were supposed to have been obtained on the coast of Nice. M. Vian showed me these specimens when I was last in Paris; and they are undoubtedly genuine examples of the respective species. M. Vian thinks that the opening of the Suez Canal may have caused their appearance upon the shores of France; I cannot prove the contrary, but, from the make-up of the skins, I must confess I am very sceptical as to their having got so far as Nice *alive*. They had passed through at least one, if not two dealers' hands before M. Vian saw them.

33. Larus atricilla, Linn.

Larus atricilla, Linn. Syst. Nat. i. p. 225 (1766), nec Pallas (ex Catesby); Gm. Syst. Nat. i. p. 600 (1788); Temm. Man. d'Orn. ed. 2, pt. ii. p. 779 (Mediterranean, in error); Montagu, Orn. Dict. Rennie's ed. p. 259 (1833) (Winchelsea); Schl. M. P.-Bas, *Lari*, p. 44 (1863); Scl. & Salv. P. Z. S. 1871, p. 576; Coues, B. N.-West Am. p. 650 (1874); Reid, Zoologist, 1877, p. 489 (Bermudas).

Larus ridibundus, Wilson, Am. Orn. ix. p. 89, pl. 74. fig. 4 (1814), nec Linn.; Léotaud, Ois. de Trinidad, p. 532.

Xema atricilla, Boie, Isis, 1822, p. 563; Cab. in Schomb. Guiana, iii. p. 761.

Gavia atricilla, Macgill. Man. Brit. Orn. ii. p. 240 (1842).

Chroicocephalus atricilla, Bruch, J. f. Orn. 1853, p. 106; Lawr. B. N. Am. p. 850 (1858).

Chroicocephalus serranus, Bruch, J. f. Orn. 1853, p. 106 (nec Tschudi).

Atricilla catesbyi, Bruch, J. f. Orn. 1855, p. 287.

"*Atricilla megalopterus*," Bp.; Bruch, J. f. Orn. 1855, p. 287.

"*Atricilla micropterus*," Bp.; Bruch, tom. cit. p. 288.

Hab. America, from Maine, on the east coast, down to the mouth of the Amazons and to the West-Indian Islands; on the west coast,

California, Mexico, Guatemala, and as far south as Tumbez, the northern frontier of Peru (*Jelski*). Once obtained by Col. Montagu at Winchelsea, Sussex. The specimen in the British Museum, from his collection, is undoubtedly of this species; but there seems to be no warrant for its reputed occurrence in Southern Europe and the Mediterranean.

This species may always be known by its black primaries.

34. LARUS FRANKLINI, Sw. & Rich.

Larus atricilla, J. Sabine, App. Franklin's Polar Sea, p. 695 (1823), nec Linn. nec auctt. (the description clearly applies to this species).

Larus franklini, Sw. & Rich. F. Bor.-Am., Birds, p. 424, pl. lxxi. (1831); Schlegel, Mus. Pays-Bas, *Lari*, p. 36 (1863); Scl. & Salv. P. Z. S. 1871, p. 577; Newton, P. Z. S. 1871, p. 57, pl. iv. fig. 4, egg (Manitoba); Coues, B. N.-West Am. p. 653 (1874).

Larus cucullatus, Licht. MSS. (Mexico), type in Berlin Mus. (examined, H. S.).

Larus pipixcan, Wagler, Isis, 1831, p. 515.

Xema franklini, Bp. Comp. L. B. Eur. & N. Am. p. 62 (1838); Boie, Isis, 1844, p. 194.

Xema pipixcan, Boie, *loc. s. cit.*

Chroicocephalus franklini, Bruch, J. f. Orn. 1853, p. 104, et 1855, p. 289; Lawr. B. N. Am. p. 851 (1858).

Chroicocephalus cucullatus, Bruch, J. f. Orn. 1853, p. 104, et 1855, p. 290; Lawr. B. N. Am. p. 851 (1858); Coues, Proc. Phil. Ac. 1862, p. 309.

Chroicocephalus kitlitzii, Bruch, J. f. Orn. 1853, p. 104 (described from a drawing), nec Swinhoe, P. Z. S. 1860, which = *L. saundersi*.

Chroicocephalus schimperi, Bruch, J. f. Orn. 1853, p. 104 (nec Schlegel, 1863, which = *L. saundersi*).

Larus cinereo-caudatus, Ph. et Landb. Wiegm. Arch. 1861, p. 293.

Hab. Interior of North America, west of the Mississippi; breeds in Manitoba; seldom visits the Atlantic coast, but has once occurred at St. Bartholomew's, West Indies (*Sund.*); goes down the Pacific coast as far as Chili, whence I have a fully adult example with partial hood, collected by Mr. E. Reid, of Santiago, and also one from Callao, Peru.

The primaries of this species undergo much alteration with the age of the bird; and in time the subapical mirror on the first extends over the greater part of the webs.

From the description there can be little or no doubt that Bruch's *L. kitlitzi* and *L. schimperi* are referable to this species. Both were suppressed in his second review (1855), when he corrected a few of his more glaring errors; and all trace of the second name has vanished from the Mainz Museum, where I especially looked for it, as Schlegel had adopted it for a totally different Chinese species. The type was said to have come from New Zealand, had a bright red bill, dark hood, and black primaries with white tips.

35. LARUS SERRANUS, Tsch. (Fig. 9.)

Larus serranus, Tschudi, Wiegm. Arch. 1844, pt. i. p. 314; Fauna Peruana, Aves, p. 307 (1845–6); Scl. & Salv. P. Z. S. 1871, p. 577.

Chroicocephalus personatus (Natt.), Bruch, J. f. Orn. 1853, p. 104, et 1855, p. 289.

Xema cirrhocephalum, Peale; Cassin, U.S. Expl. Exp. Orn. p. 381 (1858).

Larus glaucotis, Cassin, *l. c.* p. 381 (1858).

Gavia serrana, Bp. Rev. Zool. 1855, p. 19.

Larus personatus, Natt.; Schl. M. Pays-Bas, *Lari*, p. 35 (1863).

Gavia personata, Blasius, J. f. Orn. 1865, p. 372.

Larus bonapartii, Scl. & Salv. P. Z. S. 1868, p. 178.

Hab. This fine black-hooded species is found throughout the Cordillera and the Andes of Northern Chili, Bolivia, Peru, and as far north as Ecuador, whence Mr. Salvin has a specimen. It breeds

Fig. 9.



1. 2. 3.

Three outer primaries of *L. serranus*, ad.

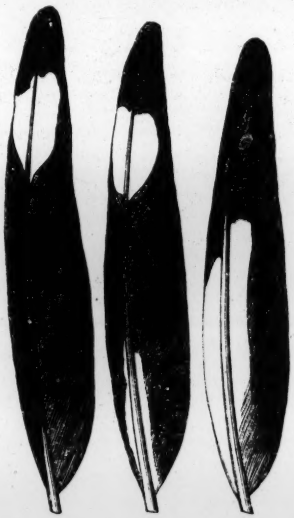
in colonies on the shores of mountain-lakes, and is well known to the Quichua-speaking Indians under the name of "Quiulla," doubtless an imitation of its cry. During the bad weather it descends to the west coast. The eggs and nestlings are as yet unknown to me.

Messrs. Sclater and Salvin (P. Z. S. 1871, p. 577) quote Burmeister as an authority for the occurrence of this species near Mendoza in the Argentine Republic; but the description which he gives clearly applies to *L. maculipennis*; indeed the dimensions cited being *smaller* than those of *his L. maculipennis*, Licht. (which, again, is not that species, but *L. cirrhocephalus*, Vieill.), show clearly that his bird cannot possibly be the real *L. serranus*, which is the largest of the group of the true Hooded Gulls in America. On the other hand, the dimensions assigned by Peale and Cassin to their respective *X. cirrhocephalum* and *L. glaucotis* (18 inches long), and the descriptions of the markings of the primaries, go to prove that those names must be referred to this species. The figure (p. 196) shows the pattern of the primaries in an adult and tolerably old bird.

36. LARUS BRUNNEICEPHALUS, Jerdon. (Fig. 10.)

Larus brunneicephalus, Jerdon, Madras Journ. xii. p. 225 (1840); Schl. Mus. P.-Bas, *Lari*, p. 35 (1863).

Fig. 10.



1 2 3.

Three outer primaries of *L. brunneicephalus*, ad.

Xema brunnicephala, Gray, List of B. in Brit. Mus. iii. p. 172 (1844); Jerdon, B. of India, iii. p. 832 (1864); Holdsworth, P. Z. S. 1872, p. 480 (Ceylon).

Chroicocephalus brunnicephalus, Bruch, J. f. Orn. 1853, p. 105.
Chroicocephalus brunniceps, Cabanis, J. f. Orn. 1853, p. 105 (note); Bruch, J. f. Orn. 1855, p. 291.
Chroicocephalus brunneicephalus, Bp. Compt. Rend. Ac. Sc. xli. p. 73 (1856); Swinhoe, P. Z. S. 1871, p. 421; Dav. et Oust. O. de la Chine, p. 521.
Xema brunneicephalum, A. David, N. Arch. Mus., Bull. vii. no. 460 (1871).
Larus lacrymosus, Licht. (Bengal, imm.), type in Berlin Mus. (examined, H. S.).
Gavina lacrymosus (Licht.); Bp. Naum. 1854, p. 212.
Gavia brunnicephalus (Jard.); Bp. Naum. 1854, p. 213.
Chroicocephalus tibetanus, Gould, P. Z. S. 1864, p. 54. [Tibet, Major Hay.]
Xema brunneicephala, Hume, Yarkand Exp. Orn. p. 300, pl. xxxii. (1873); Blyth, J. A. S. B. 1875, pt. ii. p. 162 (Burma).

Hab. Henderson found this Gull very abundant in full breeding-plumage in July, at an elevation of 15,000 feet, near the Pangong lake; and in winter it occurs both on the inland waters and along the coast of India, as far west as Sind. Eastward it occurs in Burma and visits Ceylon, where it is abundant. David obtained it abundantly in Mongolia and China, apparently as near to the sea-board as Pekin. Taczanowski, however, does not cite it amongst the species found in any part of Siberia; and it is therefore doubtful if it can be Middendorff's *L. ridibundus*, var. *major*. As regards its reported occurrence in Japan, Cassin's bird obtained in Parry's expedition is clearly *L. ridibundus*.

37. Larus ichthyaëtus, Pall.

Larus ichthyaëtus, Pallas, It. ii. App. no. 27 (1776), Caspian; Gm. Syst. Nat. i. p. 599 (1788); Pallas, Zoogr. Ros.-As. ii. p. 322 (1811); Rüpp. Reise N. Afr. Atlas, p. 27, pl. 17 (1826), Red Sea; Cassin, Perry's Exp. Japan, ii. p. 232 (1856) (?); Tristram, Ibis, 1868, p. 330, Palestine; Shelley, B. of Egypt, p. 307, pl. 13 (1872); Schlegel, M. P.-Bas, *Lari*, p. 34 (1863); Dresser, B. of Europe, pt. xviii. (June 1873).
Ichthyaëtus, Kaup, Natürl. Syst. pp.102,169 (1829), type of genus *Ichthyaëtus*.
Xema ichthyaetum, Bp. B. Eur. & N. Am. p. 62 (1838).
Larus kroicocephalus, Jameson, Journ. As. Soc. viii. p. 242 (1839).
Kroikocephalus ichthyætus, Jerdon, B. of India, iii. p. 831 (1864).
Chroicocephalus icthyaëtus, Bruch, J. f. Orn. 1853, p. 104; Swinhoe, P. Z. S. 1863, p. 327.
Larus ichthyaëtus minor, Schl. M. P.-Bas, *Lari*, p. 34 (1863).

Hab. Caspian Sea and inland lakes, Lake of Galilee (*Tristram*), Mediterranean coast of Egypt and up to Nubia, the Red Sea, thence to Bombay and down the coast to Madras, and on the lakes and large rivers of Northern India. As a straggler, in the Black Sea and the Greek Archipelago, and once at the mouth of the Exe, in Eng-

land Cassin states that Perry's expedition obtained two specimens in Yedo Bay, Japan, where it is described as abundant; but both the supposed examples were young birds without a trace of a hood, only striated on the head; and the other points of the description would equally apply to young Herring-Gulls, which I am inclined to think they were. At all events the reported occurrence of this Gull in Japanese waters remains unconfirmed; Capt. Blakiston has never met with it; and Capt. St. John, H.M.S. 'Sylvia,' during the years he was surveying those coasts, never saw it.

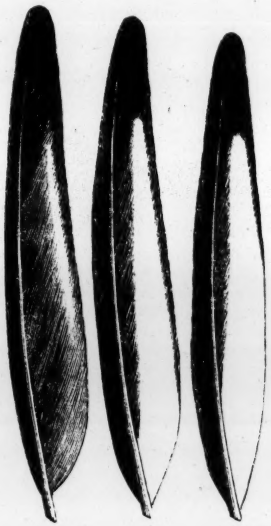
38. LARUS MELANOCEPHALUS, Natt. (Fig. 11.)

Larus melanocephalus, Natt. Isis, 1818, p. 816; id. in Temm. Man. d'Orn. 2nd ed. ii. p. 777 (1820); Schl. M. P.-Bas, *Lari*, p. 43 (1863); Degl. & Gerbe, Orn. Europ. ii. p. 437 (1867); Bree, B. of E. 2nd ed. v. p. 81 (breeding in Black Sea); Saund. Ibis, 1872, p. 79 (Thames).

Xema melanocephalus, Boie, Isis, 1822, p. 365.

Xema melanocephalon, Brehm, Vög. Deutschl. p. 757 (1831).

Fig. 11.



1. 2. 3.

Three outer primaries of *L. melanocephalus*, jr.

Xema caniceps, Brehm, Vög. Deutschl. p 758.
Chroicocephalus melanocephalus, Bruch, J. f. Orn. 1853, p. 104.
Melagavia melanocephalus, Bp. Naum. 1854, p. 213.
Gavia melanocephala, Bp. Compt. Rend. 1856, xlii. p. 771.

Hab. Mediterranean and Black Sea; outside the Straits of Gibraltar I observed it, apparently breeding, in the marshes of Huelva; and it regularly ascends the west coast of the Iberian peninsula and of France as far as Bordeaux, as is proved by the specimens annually obtained there. It is therefore not at all astonishing that an immature specimen should have been shot out of a flock of *L. ridibundus* at Barking Creek in January 1866. This example is in the British Museum.

In old birds the primaries are white, excepting a very black streak down the outer web of the first primary only; but it is not unusual to find birds with the full black hood and white tail indicative of maturity, but with a good deal of black on both the outer and inner webs of the outer five primaries, the black crossing both webs near their extremities and forming a subapical bar. The drawings (fig. 11, p. 199, and fig. 12, p. 201) show the differences between the pattern of the three outer primaries of a bird of the year, shot in March, and that of a *L. ridibundus* of about the same age.

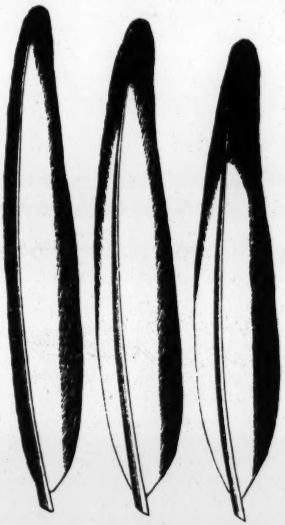
39. LARUS RIDIBUNDUS, Linn. (Fig. 12.)

? *Larus cinerarius*, Linn. Syst. Nat. i. p. 224 (1766).
Larus ridibundus, Linn. Syst. Nat. i. p. 225 (1766); Schl. M. P.-Bas, *Lari*, p. 37 (1863).
Larus erythropus, Gm. Syst. Nat. i. p. 597 (1788).
Larus cinerarius, Schäff. Mus. Orn. p. 63 (1789); Pall. Z. Rosso-As. ii. p. 326.
Larus canescens, Bechst. Orn. Tash. p. 370 (1802).
Larus atricilla, Pallas, Zoogr. Rosso-As. ii. p. 324 (1811), nec Linn.
Larus nævius, id. tom. cit. p. 327.
Larus capistratus, Temm. Man. d'Orn. 2nd ed. pt. ii. p. 785 (1820).
Xema ridibundus, Boie, Isis, 1822, p. 563.
Xema capistratus, Boie, Isis, 1822, p. 563, et 1844, p. 192.
Xema ridibundum, Brehm, Vög. Deutsch. p. 760 (1831).
Xema pileatum, id. op. cit. p. 761.
Xema capistratum, id. op. cit. p. 762.
Chroicocephalus capistratus, Eyton, Hist. Rarer Brit. B. p. 63 (1836); Bruch, J. f. Orn. 1853, p. 105.
Chroicocephalus ridibundus, Eyton, Cat. Brit. Birds, p. 53 (1836); Bruch, J. f. Orn. 1853, p. 105; Swinhoe, P. Z. S. 1871, p. 421; David & Oust. Ois. de la Chine, p. 520 (1877).
Gavia ridibundus, Bp. Naumannia, 1854, p. 213.
Gavia capistratus, Bp. *op. cit.* p. 213.
Chroicocephalus pileatus, Brehm, Naum. 1855, p. 295.
Larus brunneicephalus?, Cassin, Perry's Exp. Japan, ii. p. 233 (1856), clearly this species in winter dress.

Larus cahirinus, "Hemp. & E., Syria," Mus. Berolst (*fide* H. S.).
Larus cahiricus, "Ehr. Arabia," id. (*fide* H. S.).

Hab. Northern and temperate Europe, breeding; the Mediterranean coast to Egypt and Asia Minor, the Red Sea, Arabian coast, and the coast, interior waters, and rivers of India; ascending for 500 miles up the Burrampootra (*Godwin-Austen*), Burma, China, and

Fig. 12.



1. 2. 3.

Three outer primaries of *L. ridibundus*, jr.

Japan in winter; also throughout the more temperate portions of Siberia (breeding). It is said by Schlegel to visit "South Africa;" but I remain rather suspicious of the accuracy of the collectors who are responsible for that somewhat vague locality, so long as this statement is unconfirmed from other sources.

40. LARUS MACULIPENNIS, Licht. (Fig. 13.)

Larus maculipennis, Licht. Verz. Doubl. p. 83 (1823), Monte Video (type examined, H. S.); Scl. & Salv. Nom. Av. Neotrop. p. 148 (1873); Durnford, Ibis, 1877, p. 43 (Chuput valley, Patagonia); id. tom. cit. p. 202 (prov. B. Ayres).

Xema cirrhocephalum, Gould, Zool. Beagle, iii. p. 142 (1841), partim.

Xema cirrhocephala?, Gray, List Birds Brit. Mus. iii. p. 173 (1844), partim (East Patagonia).

Chroicocephalus maculipennis, Bruch, J. f. Orn. 1853, p. 105.

Gavia maculipennis, Blasius, J. f. Orn. 1865, p. 374.

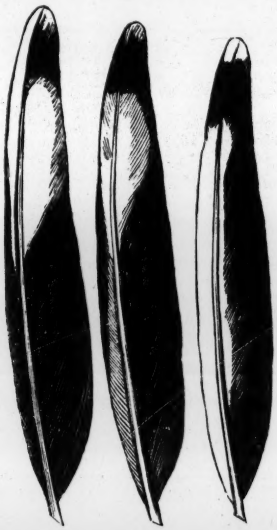
"*Larus serranus*, Tsch.," Burmeister, La Plata-Reise, ii. p. 519 (1861), nec Tschudi (Entre Rios, Mendoza).

Larus cirrhocephalus, Hudson, P. Z. S. 1870, p. 802; id. P. Z. S. 1871, p. 4, nec Vieillot.

Larus glaucodes, Saunders, P. Z. S. 1874, p. 294 (partim).

Hab. Chuput valley, North-east Patagonia (breeding), up to the La Plata, the Argentine Provinces, Mendoza, Entre Rios, Uruguay, and the south coast of Brazil.

Fig. 13.



1. 2. 3.

Three outer primaries of *L. maculipennis*, old.

Burmeister's description of the bird which he calls *L. serranus* clearly applies to this species; the dimensions (length 12 in., wing 11 in., tarsus 2 in.) exactly suit it, whilst the wing of true *L. serranus* is over 14 in. long.

The distinction between this species and the next, *L. glaucodes*, seems to rest upon the patterns of the primaries, as shown in the drawings (figs. 13 and 14). In *L. maculipennis* the black forms a bar; in *L. glaucodes* it is a mere border: and this is perfectly constant.

I have selected the primary of the *oldest L. maculipennis* I could find as presenting the least amount of black, and therefore closest to *L. glaucodes*; but, in spite of that, the difference is quite recognizable.

41. LARUS GLAUCODES, Meyen. (Fig. 14.)

Larus glaucodes, Meyen, Obs. Zool. p. 115, pl. xxiv.; id. Beitr. Zool. p. 239, pl. xxxiv. (1834); Gay, Faun. Chil. Aves, i. p. 480 (1847); Cassin, Birds U.S. Astronom. Exp. p. 204 (1855); Scl. & Salv. Nom. Av. Neotrop. p. 143 (1873).

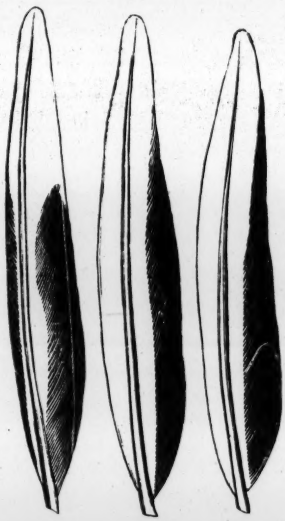
Larus glaucotes, Cabanis, Ibis, 1861, p. 312.

Larus glaucotis, Schlegel, Mus. P.-B. *Lari*, p. 42 (1863).

Xema cirrhocephalum, Gould, Zool. Beagle, iii. p. 142 (1841), part., nec Vieill.

Xema cirrocephala, Gray, List Birds Brit. Mus. iii. p. 173 (1844).

Fig. 14.



1. 2. 3.

Three outer primaries of *L. glaucodes*, old.

Xema glaucodes, Boie, Isis, 1844, p. 192?

Larus albipennis, Peale, Zool. U.S. Expl. Exp. p. 288 (1848); *fide* Cassin, in Orn. U.S. Expl. Exp. p. 379 (1858); Chili.

Larus albipennis, Licht. M.S.; Gray, List B. Brit. M. p. 173 (1844), type in Berlin Mus. (examined, H. S.).

Chroicocephalus glaucotes, Bruch, J. f. Orn. 1853, p. 105, et 1855 p. 291.

Gavia roseiventris, Gould, P. Z. S. 1859, p. 97 (Falkland Islands).

Larus roseiventris, Sclater, P. Z. S. 1860, p. 391; Abbott, Ibis, 1861, p. 166 (Falkland Islands).

Gavia glaucotis, Blasius, J. f. Orn. 1865, p. 374.

Chroicocephalus glaucodes, G. R. Gray, Hand-l. Birds, iii. p. 114.

Hab. Falkland Islands, Straits of Magellan, Western Patagonia, and coast of Chili. I cannot find any evidence of its occurrence in Eastern Patagonia; and certainly at the Chuput river, lat. 43° S., its place is taken by *L. maculipennis*.

Specimens from the Falklands seem to be smaller on the average than Chilian examples; but there is no other point of difference.

42. LARUS CIRRHOCEPHALUS, Vieill.

Larus cirrhocephalus, Vieillot, in 2nd ed. Nouv. Dict. Hist. Nat. t. xxi. p. 502 (1818), Brazil; id. Gal. des Ois. ii. p. 223, pl. 289 (1834); Schlegel, M. P.-Bas, *Lari*, p. 37 (1863); Scl. & Salv. P. Z. S. 1871, p. 578; iid. Nom. Av. Neotrop. p. 148 (1873); Saunders, P. Z. S. 1874, p. 292; Durnford, Ibis, 1877, p. 201.

Larus poliocephalus, Temm. M. d'Orn. ii. p. 780 (1820); Max. v. Wied, Beitr. iv. p. 854; vide Salv. Ibis 1874, p. 320.

Chroicocephalus cirrhocephalus, Bruch, J. f. Orn. 1853, p. 106.

Cirrhocephalus plumbiceps, Bruch, J. f. Orn. 1855, p. 288.

"*Larus maculipennis*, Licht.," Burm. Syst. Ueb. Th. Brasil. iii. p. 448 (1856), nec Licht. (Brazil coast, especially the small islands); id. La Plata-Reise, ii. p. 518. no. 256 (1861) (R. Paraná).

Gavia cirrhocephala (part.), Blasius, J. f. Orn. 1865, p. 376.

Hab. Coast of Brazil, bays and lakes, down to Rio de la Plata, and up the Paraná. Mr. Durnford did not observe it south of Buenos Ayres. On the Pacific coast it occurs near Callao, one specimen from Chorillos being in my own collection, and another, obtained by M. Grec of Lima at the Chinchas Islands in 1855, being in the Bordeaux Museum.

43. LARUS PHÆOCEPHALUS, Sw.

Larus poiocephalus (sic), Swains. B. W. Afr. ii. p. 245, pl. 29 (1837): ad. ex. believed to be the type, in Cambr. Mus. from Senegambia, examined, H. S.

Xema phæocephala, Strickl. & Scl. B. of Damar., Contrib. Orn. 1852, p. 160.

Gavia cirrhocephala (part.), Blasius, J. f. Orn. 1865, p. 376.

Larus poiocephalus, Swains., Layard, B. S. Afr. p. 368 (1867), partim; Barboza du Bocage, J. f. Orn. 1876, p. 293 (Cunene, Benguela).

Larus phæocephalus, Hartl. Orn. W.-Afr. p. 252 (1857); id. J. f. Orn. 1861, p. 273; Finsch & Hartl. Vög. Ost-Afr. p. 825 (1870); Saunders, P. Z. S. 1874, p. 292.

Cirrhocephalus poiocephalus, Gurney, Anderss. B. Damaral. p. 358 (1872).

Hab. West Coast of Africa from the Gambia down to Walvisch

Bay, Damaraland, and at Lake Ngami (*Chapman*). I possess or have examined specimens from the above localities. The species may extend as far as the Cape of Good Hope and to the south-east coast; but of this I have no positive information.

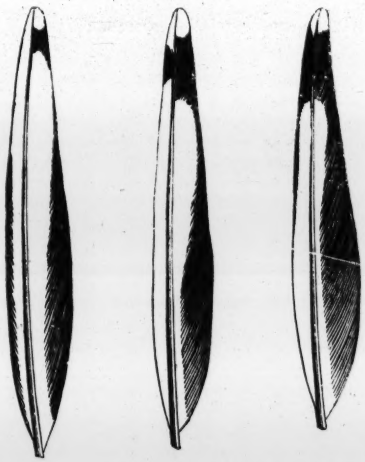
This species is very closely allied to *L. cirrhocephalus*; but it is smaller, and the bill and feet are orange-red, whilst in the larger American species those soft parts are of a deep lake-colour; and the feathers in this species do not come down so close to the base of the nostrils—differences which are quite sufficient to separate the two forms. The African species was long confounded with *L. hartlaubi* of the Cape of Good Hope, a bird belonging to a totally distinct group, and which never has a hood at all.

44. LARUS SAUNDERSI (Swinhoe). (Fig. 15.)

"*Gavia kittlitzii*, Bruch," Swinhoe, Ibis, 1860, p. 68 (not of Bruch, which is described from a drawing and is *L. franklini*).

Larus schimperi, Schlegel, M. P.-Bas, *Lari*, p. 40, 1863 (not of Bruch, 1853, nor of Bp., which =*L. franklini*).

Fig. 15.



1. 2. 3.

Three outer primaries of *L. saundersi*, ad.

Chroicocephalus kittlitzii, Swinh. Ibis, 1863, p. 428, et P. Z. S. p. 328.

Xema kittlitzii, David, N. Arch. Mus. Bull. vii. 1871, no. 461.

Chroicocephalus saundersi, Swinhoe, P. Z. S. 1871, pp. 273, 421, pl. 22; David & Oustalet, Ois. de la Chine, p. 523 (1877).

Hab. The coasts of China, especially about Amoy, in winter

(*Swinhoe*), and the interior waters, and those of Mongolia (*David*). Nidification unknown.

This well-defined species, with which my friend the late R. Swinhoe did me the honour to associate my name, is, to judge by the structure of its feet, an inland species or river-Gull during a great part of the year. The tarsi are slender, the hind toe elevated and long, and the webs of the feet are much scalloped; indeed the foot is almost that of a Marsh-Tern. Had Bonaparte or Bruch been acquainted with it, they would doubtless have created a genus for it. The bill is very stout and corvine-looking; the hood, in breeding-plumage, is of a deep metallic black; and the pattern of the primaries (see fig. 15, p. 205) is also peculiar, these being principally white with a black bar near the tip, and a black border to the edge of the inner web.

45. LARUS MINUTUS, Pallas.

Larus albus, Scop. Ann. i. Hist. Nat. p. 80. no. 106 (1769).

Larus minutus, Pallas, Reise Russ. Reichs, iii. p. 702, App. no. 35 (1776); Gm. Syst. Nat. i. p. 595 (1788); Pallas, Zoogr. Rosso-As. ii. p. 331 (1811); Schlegel, M. P.-Bas, *Lari*, p. 42 (1863); Sharpe and Dress. B. of Eur. pt. iv. (1871).

Larus atricilloides, Falk. Itin. iii. p. 355, t. 24, *fide* Gm. Syst. Nat. i. p. 601 (1788).

Xema minutus, Boie, Isis, 1822, p. 365.

Larus d'orbignyi, Audouin, Hist. Nat. de l'Egypte, pl. 9. fig. 3, Expl. p. 271 (1825).

Hydrocolœus minutus, Kaup, Nat. Syst. p. 113 (1829).

Larus nigrotis, Lesson, Tr. d'Orn. p. 619 (1831).

Chroicocephalus minutus, Eyton, Hist. R. Brit. B. p. 61 (1836); Bruch, J. f. Orn. 1853, p. 105.

Gavia minuta, Macgill. Hist. Brit. B. v. p. 613 (1852).

Hab. European coasts and occasionally inland (on passage and in winter); breeding in the marshes of Russia, and formerly in Gottland. Middendorff obtained it in May on the Lena, to the south of Jakusk, and as far east as the sea of Okotsk. Once in north India (*Irby*); North Africa to Egypt in winter.

Scopoli's description of *L. albus* applies fairly to this species, but it is not sufficiently precise to enforce the adoption of that name to the prejudice of a long accepted one like that of Pallas.

46. LARUS PHILADELPHIÆ (Ord). (Fig. 16.)

Sterna philadelphia, Ord, Guthrie's Geogr. 2nd Am. ed. ii. p. 319 (1815), *fide* Lawr., B. N. Am. p. 252.

Larus minutus, J. Sabine, App. Franklin's Polar Sea, p. 696 (1823); Sw. & Rich. F. Bor.-Am. Birds, p. 426 (1831), nec Pallas.

"*Larus capistratus*, Temm.," Bp. Specch. Comp. p. 69 (1828), nec Temm.

Larus melanorhynchus, Temm. Pl. Col. livr. 85, tab. 504 (1830), Chili?

Larus bonapartii, Sw. & Rich. F. Bor.-Am., Birds, p. 425, pl. 72

(1831); Thompson, B. of Ireland, iii. p. 317 (1851), near Belfast; Schlegel, Mus. P.-Bas, *Lari*, p. 41 (1863).

Xema bonapartii, Bp. Birds of Eur. and N. Am. p. 62 (1838).

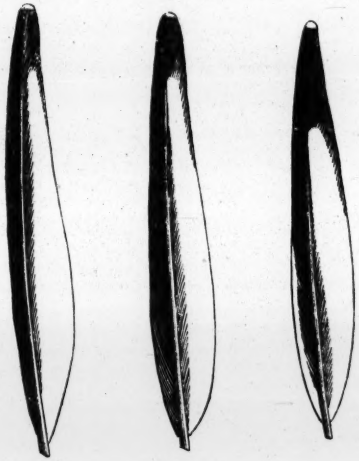
Chroicocephalus bonapartii, Bruch, J. f. Orn. 1853, p. 105, et 1855, p. 292.

Chroicocephalus subulirostris, Bp.; Bruch, J. f. Orn. 1853, p. 105 (type in Mainz Mus. examined, H. S.).

Gavia bonapartii, Bp. Naumannia, 1854, p. 213.

Gavia subulirostris, id. tom. cit. p. 213.

Fig. 16.



1. 2. 3.

Three outer primaries of *L. philadelphiæ*, jr.

Chroicocephalus philadelphia, Lawr. B. N. Am. p. 852 (1858); Dall & Bann. Tr. Chicago Ac. 1869, p. 305 (Alaska); Newton, P. Z. S. 1871, p. 57, pl. iv. fig. 6, egg (Arctic America).

Gavia bonapartei, Blasius, J. f. Orn. 1865, p. 371.

Larus philadelphia, Allen, Am. Nat. iii. p. 643 (Salt Lake); Harting, Handbk. Brit. B. p. 172 (1872); Reid, Zoologist, 1877, p. 489 (Bermudas).

Hab. British North America and Alaska (in summer), breeding on the Yukon and neighbouring localities. In autumn it descends the coasts of America, as far as California on the west and North Carolina on the east; as a straggler it has visited the Bermudas and also the British Islands.

The drawing (fig. 16) of the outer primaries in the young shows wherein the pattern differs from those of allied species. In the adult the distinctions are yet more marked.

Genus Rhodostethia, Macgill.

The distinguishing characteristic of this genus is the *cuneate tail*, in which respect the sole representative species is unlike every other. On account of this elongation of the central feathers of the tail, some systematists have placed it next to the *Stercorariinæ*; but it should not be inferred from this solitary point of resemblance that the two genera are at all closely related, their representatives being in other respects far apart. It is much to be desired that the sternum of the next specimen obtained should be preserved, as I believe this part of its structure has never been critically examined.

47. Rhodostethia rosea, Macgill.

Larus roseus, Macgill. Wern. Soc. Trans. v. no. xiii. p. 249 (1824), descr. of sp. from Melville Peninsula; Jard. & Selby, Ill. Orn. vol. i. pl. xiv.

Larus rossii, Richards. App. Parry's 2nd Voy. p. 359 (1825), Melville Peninsula; J. C. Ross, App. Ross's 2nd Voy., Nat. Hist. p. 36 (1835), Felix Harbour, Boothia; Sw. & Rich. F. Bor.-Am. ii. Birds, p. 427 (1831); J. C. Ross, App. Parry's Narr. p. 195 (1828).

Rossia rosea (Macgill.), Bp. Comp. List, p. 62 (1838).

Rhodostethia rossi, Macgill. Man. Brit. Orn. pt. ii. p. 253 (1842).

Rhodostethia rossii, id. Brit. Birds, v. p. 618.

Rhodostethia roseus, Bruch, J. f. Orn. 1853, p. 106.

Rhodostethia rosea, Saunders, Ibis, 1875, p. 484 (jr.); Payer, Austrian Exp. ii. p. 91 (English transl.); Dresser, B. of Eur. pt. i. (1877)

"*Larus collaris*," MS., Schreibers, in Mus. Vindob.

Hab. Melville Peninsula, 69½° N. lat., and Boothia, straggling to Greenland, once to the Faroes, once to Heligoland, and (on very questionable authority) once to England. This last specimen, which I have examined, has every appearance of having been mounted from a skin and not from the flesh. Ross and Parry state that it was seen to the north of Spitzbergen in about 82° N. lat.; but they did not obtain specimens, and no subsequent visitors to that district have observed it; more recently Lieut. Payer says that it was obtained about Franz-Josef Land.

There can be no doubt of the prior claim of Macgillivray's name for this species; but its imposition, in anticipation of that which Richardson intended to bestow on it, gave rise to a good deal of bad feeling at the time.

In 'The Ibis,' 1875, p. 484–487, I gave a description of the immature plumage of this Gull from two specimens in the Mainz Museum, and enumerated the eleven examples known to exist; to these may be added one more in Copenhagen, and one, of which Mr. O. Salvin has recently informed me, in the museum of Vienna: total thirteen specimens.

In reply to inquiries respecting the Vienna example, Hr. von Pelzeln informs me that it formed part of the collection made by Giesecké during his seven years' residence in Greenland, and came

into the possession of the Imperial Museum in 1818, when it received from Professor Schreibers the MS. and unpublished name of *Larus collaris*. In the interval between the publication of the 4to edition of Ross's 'Voyage to Baffin's Bay' and the later 8vo edition (both of which bear the date of 1819), Ross, or Leach (for, although under Ross's name, Leach was probably the real authority) heard of Schreibers's name, and, jumping at the conclusion that Schreibers's bird was *L. sabini*, inserted the synonym of *X. collaris* (Schr.) for that species in the 8vo edition. Had Schreibers's description been published, his name would have considerably antedated the present one.

Genus Xema, Leach.

The real distinguishing character of this genus, as instituted by Leach, is the *forked tail*; but the name has been improperly employed by Boie and others for many other species. Leach, however, defined it most clearly; and a generic name should never be used in any other sense than that of the founder.

48. Xema sabinii (Sabine).

Larus sabini, J. Sabine, Tr. Linn. Soc. xii. p. 520, pl. 29 (1818); J. Wilson, Ill. Ornith. pl. iii. (1831).

"*Xema sabini*, Leach," J. Ross, App. Ross's Voy. Baff. Bay, p. 57 (1819), 4to ed.; Steph. in Shaw's Gen. Zool. xiii. pt. i. p. 177, pl. 20 (1826); Eyton, Rarer Brit. B. p. 54 (1836).

"*Xema collaris* (Schreibers)," Ross in App. Ross's Voy. Baf. Bay, ii. p. 164 (1819), 8vo ed. (not in 4to ed.), nec Schreibers.

Gavia sabini, Macgill. Man. Brit. Orn. ii. p. 241 (1842).

Larus sabini, J. C. Ross, App. Ross's 2nd Voy. p. 37 (1835).

Larus sabinii, Richardson, App. Parry's 2nd Voy. p. 360 (1825); Sw. & Richs. F. Bor.-Am., Birds, p. 428 (1831); Middendorff, Sib. Reis., Zool. ii. p. 244, pl. xxiv. fig. 5, xxv. fig. 1 (young and egg), (1853).

Xema sabinii, Bruch, J. f. Orn. 1855, p. 292; Lawr. B. of N. Am. p. 856 (1860); Newton, P. Z. S. 1871, p. 57, pl. iv. fig. 5 (egg); Dresser, B. Europe, pt. xxxi. August 1874.

Larus sabinei, Schl. M. P.-Bas, *Lari*, p. 44 (1863).

Xema sabinei, Coues, B. of N.W. Am. p. 660 (1874-5); Reid, Zoologist, 1877, p. 490 (Bermudas).

Hab. Arctic America, breeding to the north of Upernavik, in Greenland, and then across to the west, breeding in Alaska (*Dall*); not rare in Plover Bay, Eastern Siberia (*Dall*), and breeding on the tundras of the Taimyr, north of 74° (*Middendorff*). In autumn it migrates southward; and many specimens have from time to time been obtained on the British coasts and those of the continent, as far east as Holstein, and on the French coasts. Most of these are birds of the year; but Dr. L. Bureau has an adult, with full black hood, captured on the coast of Brittany on August 25th, 1872. In America its southern range, as until now recorded, was down to New York on the east, and to Great Salt Lake, Utah, on the west—

roughly speaking, as far as 40° N. lat.; but Messrs. Sclater and Salvin have recently shown me a specimen from Prof. Steere's collection[1], Mus. University of Michigan, labelled "Macabi, September 1872," and on the card-label "Tumbez," Macabi Island being a little to the north of Huanchacho on the coast of Peru, in nearly 8° S. lat.—an enormous extension of its previously known limits. It is in adult plumage, with the exception of some dusky feathers on the nape; the forehead and head are white and devoid of the hood, which it was reasonable to suppose would only be worn during the breeding-season, although this is the first absolute *proof* I have had of this; the bill as in adults; the tail white and well-forked; feet rather faded. I imagine this to be a bird of the second year. This species has once occurred at the Bermudas.

The name of *X. collaris* was applied to this species as a synonym in the 8vo edition of Ross's 'Voyage' (1819), under the erroneous impression that this was the *L. collaris* to which Prof. Schreibers, then Director of the Vienna Museum, had given that MS. and unpublished name; but as a matter of fact that name belongs to an example of *Rhodostethia rosea*. For the elucidation of this point I am indebted to the kindness of Herr A. von Pelzeln, who also informs me that the Vienna Museum is the possessor of what is probably the oldest specimen of this species in any European collection, it having been received, without any published name or description, from the Ornithological Institution of that city about 1806.

49. Xema furcatum (Neboux).

Mouette à queue fourchue, Neboux, Rev. Zool. 1840, p. 290.

Larus furcatus (Neboux), Voy. 'Vénus,' Atlas, pl. x. (1846); Prévost & Des Murs, Voy. 'Vénus,' v. Ois. p. 277 (1855).

Xema furcatus, Bruch, J. f. Orn. 1853, p. 103.

Creagrus furcatus, Bp. Naumannia, 1854, p. 213; Bruch, J. f. Orn. 1855, p. 292; Salvin, Tr. Zool. S. ix. p. 506 (Galapagos).

Hab. The type of this species in the museum of Paris is said to have been obtained at Monterey, California, in November, by Dr. Neboux of the French frigate 'Vénus.' The only other specimen known to exist is in the British Museum, and was obtained during the voyage of H.M.S.'s 'Herald' and 'Pandora,' at Dalrymple Rock, Chatham Island, Galapagos group. The 'Herald' appears to have visited Chatham Island between the 11th and 16th January, a date which is worth bearing in mind, as the British-Museum specimen seems to be in fully adult plumage; the grey tint which pervades the lower part of the neck and breast in the Paris specimen, and which is probably a sign of comparative immaturity, having disappeared, leaving the hood well defined. But for the absence of the distinct collar at the bottom of the hood, and the narrow white band of feathers at the base of the upper mandible, this bird might be briefly described as a gigantic Sabine's Gull, the tail being rather more forked in proportion than in that species. It is certainly remarkable that, in spite of the researches of the American naturalists, no other speci-

[1] See above, p. 141.

men of this Gull should ever have been obtained in any part of California; and Mr. Salvin inclines to think the Californian locality an erroneous one, in view of similar mistakes known to have been made with the birds collected during the voyage of the 'Vénus.' It is on the other hand somewhat strange that if the head quarters of this Gull, of which the appearance is sufficiently striking to attract attention, are in the Galapagos group, none of the other visitors or naturalists should have brought any news of it.

Creagrus is one of Bonaparte's arbitrary and undefined genera; and there seems to be no structural difference to warrant the generic separation of this species from *Xema sabinii*.

In this paper I have from time to time acknowledged with much pleasure the assistance I have received from my friends and correspondents; and I have now to render my especial thanks to the authorities of the British and Cambridge Museums, and of the Smithsonian Institution, Washington, and to Dr. Brewer of Boston, to Professor Peters of Berlin, Professor Reinhardt of Copenhagen, M. Oustalet, M. Bouvier, Mr. O. Salvin, Mr. H. Seebohm, Mr. Harvie-Brown, Mr. Gervase Matthew, R.N., and Mr. E. Hargitt, for the opportunities they have severally afforded me of examining examples of rare species and also series of specimens.

P.S. (April 1st).—I take this opportunity of correcting an error in my paper on the *Sterninæ* (P. Z. S. 1876, p. 671) where two species are united under the name of *Anous cæruleus*. At that time I had not seen a specimen of the real *A. cæruleus*, Bennett; and that species and *A. cinereus*, Gould, are so very much alike that, until examples were available for comparison, the descriptions and plates might easily have been taken to refer to the same species in different stages of plumage. Seen by the light of further experience they appear to be distinct; and the following is their synonymy and habitat:—

ANOUS CÆRULEUS (Bennett).

Sterna cerulea, F. D. Bennett, Narr. Whaling-Voy. round Globe, ii. App. p. 248 (1840), Christmas Island, Pacific.

"*Sterne cendré*," Neboux, Rev. Zool. Oct. 1840, p. 291, et *Stolida cinerea*. id. Voy. 'Vénus,' Atlas, pl. 9 (1846); nec *Anous cinereus*, Gould, P. Z. S. 1845 (Pacific, N. of Equator).

Sterna teretirostris, Lafresnaye, Rev. Zool. 1840, p. 242, et *Procelsterna tereticollis*, id. Mag. de Zool. 1842, pl. 29: no locality; both described from a single specimen purchased from a dealer at Havre.

Anous parvulus, Gould, P. Z. S. 1845, p. 104 (described from a specimen obtained by Bennett at Christmas Island); Cassin, U.S. Expl. Exp., Birds, p. 393 (Honden Island, Low archip. 14° S., 138° W.).

Megalopterus plumbeus, Peale, U.S. Expl. Exp. p. 285 (1848), Honden Island.

Anous cinereus (Neb.), Finsch and Hartl. F. Central-Polynesiens, p. 239 (1867), Phœnix group, 3° 8′ S., 171° W., nec Gould.

Hab. Pacific, from a little north of the Equator; Christmas Island; the Ellice group, 9° S., 179° E., whence there are two specimens in, the British Museum recently obtained by the Rev. S. J. Whitmee; the Phœnix group; and Honden Island, Low archipelago.

ANOUS CINEREUS, Gould.

Pelecanopus pelecanoides, G. R. Gray, L. Birds Brit. M. iii. p. 180 (Australia, presented by Sir T. Mitchell).

Anous cinereus, Gould, P. Z. S. 1845, p. 104 (N.E. Australia); id. B. Australia, vii. pl. 76 (1848), Norfolk I. and N.E. coast Australia.

Procelsterna albivitta, Bp. Compt. Rend. xlii. 1856, p. 773; Gould, Hand-b. B. Austr. ii. p. 420 (1865); Gray, Hand-l. iii. p. 123 (1871).

Sterna cinerea, Schlegel, M. P.-Bas, *Sternæ*, p. 38 (1863), Australia.

Anous albivittatus, Finsch, P. Z. S. 1877, p. 776 (Eua, Friendly group).

Hab. Norfolk Island; N.E. Australia and the Tonga or Friendly group, in about 22° S., 175° W. It is presumably the species observed by Mr. E. L. Layard in the Fiji group.

The range of these two species appears to be nearly parallel, that of *A. cæruleus* being the more northerly. *A. cæruleus* is smaller than *A. cinereus*, Gould, and is darker all over, especially on the underparts, which are blue-grey, whereas in *A. cinereus* they are nearly white. The differences are too great to be explained away as being due to age, and I admit the distinctness of the two species; but they are very closely allied. The fact of their being found in such close proximity within so limited an area is very remarkable.

February 19, 1878.

Prof. Mivart, F.R.S, V.P., in the Chair.

Mr. P. Geddes read a memoir on the mechanism of the odontophore in certain mollusca. In this paper the view of Cuvier that the movements of the radula depend upon those of the underlying cartilages was substantially revived. Arguments were adduced against the more recent theory of Prof. Huxley that it runs like a chain-saw, the cartilages merely forming a pulley-block. The use of bacteria as food by *Limnæus* was also described in the memoir, which will be published in the Society's 'Tranactions.'

Mr. Sclater exhibited the skin of a fine adult Cassowary, which had recently been acquired for the collection of the British Museum. The specimen was labelled "Wandammen, May, 1876," and was



Head of *Casuarius salvadorii*.

believed to have been obtained by the collectors of Herr Bruijn, of Ternate. Wandammen is situated on the western coast of the Bay of Geelvink, near the southern extremity[1].

Mr. Sclater stated that the only Cassowary of the present form known from this locality was the species shortly indicated by Beccari in his "Lettera Ornitologica" (Ann. Mus. Civ. Genova, vii. p. 717) as *Casuarius tricarunculatus*[2]; but there were no traces whatever of a third wattle in the present specimen.

The form of the casque in the present bird was nearly that of *C. australis*, the summit being elevated high above the head, and much compressed laterally, but forming almost a point at the summit instead of a longitudinal ridge (see fig., p. 213). The wattles were two, one on each side of the median line, closely approximating at their bases, but divided down nearly to their origin, and about three inches in length.

The species, which Mr. Sclater considered to be new to science, must, he said, be placed in the first section of his arrangement as given in P. Z. S. 1875, p. 87, next to *C. galeatus*, from which the form of the helmet distinguished it. From *C. beccarii* of the Arru Islands it might be known by the more completely divided neck-wattles.

The whole length of the body of the bird, from the tip of the casque to the tip of the tail, was about five feet; the tarsus measured 12·5 in., the middle toe 8·5 in. The distance from the commissure of the mandible to the top of the casque was 7·5 in., the distance from the gape to the extremity of the bill 7·5 in.[3]

A communication was read from Mr. F. Day, F.Z.S., containing the following remarks on Mr. Whitmee's paper on the manifestation of fear and anger in Fishes, read at the last meeting.

"At the last meeting of the Society (February 5th), Mr. Whitmee read a paper on the manifestation of fear, anger, &c., by Fishes, observing that a recent author, 'On the Expression of the Emotions,' had entirely omitted allusion to this class of Vertebrates, whilst, as regards anger, he believed that no observations had been recorded. I propose offering a few remarks upon the foregoing, as well as upon some other subjects touched upon by Mr. Whitmee.

"The means of expression in animals adverted to by Mr. Darwin (excluding those of the ears, which would be out of place in fishes) are:—sounds, vocally or otherwise produced; the erection

[1] See the chart of Geelvink Bay in 'Cosmos,' vol. viii. tabb. 3 & 10.

[2] The only known specimen of *C. tricarunculatus* was, as Count T. Salvadori kindly informs me, still living in Ternate in July last, where it was seen by M. Laglaize.

[3] [Since these remarks were made I find that an example of this same Cassowary was exhibited by M. Oustalet at a meeting of the Association Scientifique de France on February 23rd, and the species named *C. salvadorii* (see Bull. Ass. Sc. de France, no. 539, vol. xxi. p. 349). I have therefore withdrawn my name in favour of that of M. Oustalet. I think it probable that the Cassowary from Southern New Guinea, formerly living in the Society's Gardens, which I referred (P. Z. S. 1875, p. 527) with some doubt to *C. beccarii*, is a younger individual of this same species.—P. L. S.]

of dermal appendages under the influence of anger or terror, which last would be analogous to the erection of scales and fin-rays in the class Pisces. Regarding special expressions, as those of joy, pain, astonishment, &c., we could hardly expect to find such so well marked in fishes as in some of the higher animals, in which the play of the features often affords us an insight into their internal emotions. Eyes[1] destitute of movable eyelids, cheeks covered with scales, or the head enveloped in dermal plates, can scarcely mantle into a smile or expand into a broad grin. We possess, however, one very distinct expression in fishes, which is absent or but slightly developed in many[2] of the higher animals—namely, change of colour. All are aware that when a fish sickens its brilliant colours fade, but less so how its colour may be augmented by anger, and a loss of it be occasioned by depression the result of being vanquished by a foe. Some forms also emit sounds when actuated by terror, and perhaps in times of anger; but of this last I possess no decided proofs.

"As regards manifestations of anger, Dr. Cantor makes the following remarks on the *Macropodus pugnax*[3]:—'When the fish is in a state of quiet, with the fins at rest, the dull colours present nothing remarkable. But if two are brought within sight of each other, or if one sees its own image in a looking-glass, the little creature becomes suddenly excited, the raised fins and the whole body shine with metallic colours of dazzling beauty, while the projected gilt membranes, waving like a black frill round the throat, add something grotesque to the general appearance. In this state it makes repeated darts at its real or reflected antagonist. But both, when taken out of each other's sight, instantly become quiet. . . . . The Siamese are as infatuated with the combats as the Malays are with their cock-fights, and stake considerable sums, and sometimes their own persons and their families. The license of exhibiting fish-fights is farmed, and affords a considerable annual revenue to the King of Siam.'

"The foregoing extract shows anger in fishes demonstrated by change in colour and the erection of the fins and gill-membranes. I will now give an observation respecting the three-spined Stickleback[4]. After a fight between two examples 'a strange alteration takes place almost immediately in the defeated party: his gallant bearing forsakes him; his gay colours fade away; he becomes again speckled and ugly; and he hides his disgrace amongst his peaceable companions, who occupy together that part of the tub which their tyrants have not taken possession of; he is, moreover, for some time the constant object of his conqueror's persecution.' In fact we here perceive how the disgrace of defeat affects the spirits of the

[1] Couch (Illustrations, &c., p. 305) says, "The faculty of giving forth brilliant light from the eyes, as in a cat, is said to have been observed by fishermen in the Blue Shark."

[2] Numerous examples of the Saurians are exceptions.

[3] Cantor, Catal. Mal. Fish, 1850, p. 87. Sir J. Bowring, in his account of Siam, p. 155, gives a very similar account of the battles of these fishes.

[4] Couch, 'British Fishes,' 1865, vol. iv. p. 172.

vanquished; this reacts on his health, and as a result his brilliant hues fade away. The conqueror, on the other hand, exulting in his victory becomes more resplendent; he does not forget his former triumph, and considers it no disgrace to occasionally lord it over his beaten foe.

"Fear is shown by fish in many ways. 'When hooked or netted they sometimes empty their stomachs by an instinctive act of fear, or to facilitate escape by lightening their load' (Owen, Comp. Anat. i. p. 419). There is not an angler unacquainted with the natural timidity of fishes, nor a keeper in charge of a salmon-pass, who does not know how easy it is for poachers to deter the salmon from venturing along the path raised expressly for his use.

"Amongst the coral-reefs of the Andaman Islands I found the little *Heliastes lepidurus* abundant. As soon as the water was splashed they appeared to retire for safety to the branching coral, where no large fish could follow them; so frightened did they become, that on an Andamanese diving from the side of the boat, they at once sought shelter in the coral, in which they remained until it was removed from the sea. In Burma I observed, in 1869, that when weirs are not allowed to stretch across the rivers (which would impede navigation), the open side as far as the bank, is studded with reeds; these, as the water passes over them, cause vibration, and occasion a curious sound alarming the fishes, which, crossing to the weired side of the river, become captured.

"Under the influence of fear or anger the well-known Climbing Perch of India (*Anabas scandens*) not only erects its spiny-rayed fins and its gill-covers, but also the scales on its body, even down to those along the base of the caudal fin[1]; this to a less extent, perhaps, appears common to spiny-rayed forms.

"Hooker, alluding to Gulls, Terns, Wild Geese and Pelicans in the Ganges valley, observes, 'These birds congregate by the sides of pools and beat the water with violence, so as to scare the fish, which then become an easy prey—a fact which was, I believe, first indicated by Pallas during his residence on the banks of the Caspian Sea'[2]. Fishes, under the influence of terror, dash about with their fins expanded, and often run into places which must destroy them. Thus droves and droves of Sardines in the East, impelled by the terror of pursuing Sharks, Bonitoes, Seir, and other voracious fishes, frequently throw themselves on the shores in enormous quantities. Friar Odoric, who visited Ceylon about 1320, says, 'There are fishes in those seas that come swimming towards the said country in such abundance, that for a great distance into the sea nothing can be seen but the backs of fishes, which, casting themselves on the shore, do suffer men for the space of three daies to come, and to take as many of them as they please, and then they return again into the sea'[3].

"Fishes frequently show distinct signs of affection. Yarrell ('British Fishes') mentions how a person who had kept two

[1] 'Fishes of Malabar' (1865), p. 133.

[2] Himalayan Journals, vol. i. p. 80.

[3] Hakluyt. vol. ii. p. 37.

small ones together in a glass vessel gave one away; the other refused to eat, and showed evident symptoms of unhappiness until his companion was restored: Pennant, how the River-Bullhead "deposits its spawn in a hole it forms in the gravel, and quits it with great reluctance:" General Hardwicke, how the Gouramy (*Osphromenus olfax*), in the Mauritius, forms a nest amongst the herbage growing in the shallow water in the sides of tanks. Here the parents continue to watch the place with the greatest vigilance, driving away any interloping fish. The amphibious walking fish of Mysore (*Ophiocephalus striatus*) appears to make a nest very similar to that of the Gouramy, and over it the male keeps guard; but should he be killed or captured, the vacant post is filled by his partner (Colonel Puckle). When very young the fishes keep with, and are defended by their parents, but so soon as they are sufficiently strong to capture prey for themselves they are driven away to seek their own subsistence (see 'Fishes of India,' p. 362). But it is not only these monogamous amphibious fishes which show an affection for their eggs and also for their fry, but even the little *Etroplus maculatus* has been observed to be equally fond of its ova. 'The eggs are not very numerous, and are deposited in the mud at the bottom of the stream, and, when hatched, both parents guard their young for many days, vigorously attacking any large fish that passes near them'[1].

"Although the proceedings of the members of the marine and estuary genus *Arius* and its allies show not quite so distinctly signs of affection, still it must be a well-developed instinct which induces the male to carry about the eggs in his mouth until hatched, and to remove them in this manner when danger is imminent. I have taken the ova just ready for the young to come forth out of the mouth and fauces of the parent (male) fish; and in every example dissected there was no trace of food in the intestinal tract.

"At many temples in India fishes are called to receive food by means of ringing bells or musical sounds. Carew, in Cornwall, is said to have called his Grey Mullet together by making a noise like chopping with a cleaver. Lacépède relates that some fishes, which had been kept in the basins of the Tuileries for more than a century, would come when called by their names, and that, in many parts of Germany, Trout, Carp, and Tench are summoned to their food by the sound of a bell. These instances are doubtless mostly due to the fishes having learnt by experience that on the hearing certain sounds they may expect food. But Lacépède mentions that some were able to distinguish their individual names; and the same occurs in India. Lieutenant Conolly remarked upon seeing numerous fishes coming to the Ghaut at Sidhnath to be fed when called; and on 'expressing our admiration of the size of the fish, "Wait," said a bystander, "until you have seen *Raghu*." The Brahmin called out his name in a peculiar tone of voice; but he would not hear. I threw in handful after handful of ottah (flour) with the same success, and was just leaving the ghaut, despairing and doubting,

[1] Jerdon, 'Madras Journal of Literature and Science,' 1849, p. 143.

when a loud plunge startled me. I thought somebody had jumped off the bastion of the ghaut into the river, but was soon undeceived by the general shout of "Raghu, Raghu," and by the fishes, large and small, darting away in every direction. Raghu made two or three plunges, but was so quick in his motions that I was unable to guess at his species'[1].

"Although I have alluded to an increased brilliancy of colour being caused by anger, and a dull hue occasioned by terror or illness, there appears to be still another cause at work. During the breeding-season some species, such as *Periophthalmus schlosseri*, appear to become more brilliant, especially the males, as I have observed in my report on the freshwater fishes of Burma.

"Pallegoix states that in Siam the Dog's-tongue is a fish shaped like a Sole; it attaches itself to the bottom of boats, and makes a sonorous noise, which is more musical when several are stuck to the same boat and act in concert (vol. i. p. 193). These noises can scarcely be due to anger or fear. Sir J. Bowring (vol. ii. p. 276) also remarks upon having heard this fish, 'which sticks to the bottoms of the boats, and produces a sound something like that of a Jew's harp struck slowly, though sometimes it increases in loudness, so as to resemble the full sound and tones of an organ. My men have pointed me out a fish about four inches long as the author of the music.'

"Some years since, at Madras, I obtained several specimens of a freshwater Siluroid fish (*Macrones vittatus*) which is termed 'the fiddler' in Mysore. I touched one which was on the wet ground, at which it appeared to become very irate, erecting its dorsal fin, making a noise resembling the buzzing of a bee, evidently a sign of anger or terror. Having put some small Carp into an aquarium containing one of these fishes, it rushed at a small example, *seized it by the middle of its back*, and shook it like a dog killing a rat; at this time its barbels were stiffened out laterally like a cat's whiskers[2].

"Many fish, when captured, make noises, perhaps due to terror. Thus the *Caranx hippos*, *Tetrodon*, and others grunt like a pig. Darwin (Nat. Journ. vol. vii.) remarks on a *Silurus* found in the Rio Parana, and called the Armado, which is remarkable for a harsh grating noise when caught by hook and line; this noise can be distinctly heard when the fish is beneath the water.

"Aristotle and Ælian were aware of this faculty in some of the fishes of the Mediteranean[3].

"The Cuckoo-Gurnard (*Trigla pini*) and the Maigre (*Sciæna aquila*) utter sounds when taken out of the water[4]; and Herrings, when the net has been drawn over them, have been observed to do

[1] "Observations on the Past and Present Condition of Onjein," 'Journal of the Asiatic Society of Bengal,' vi. p. 820.

[2] 'Fishes of India,' p. 449.

[3] See 'De Animal.' lib. iv. cap. ix.; Ælian, lib. x. cap. xi.; Pliny, lib. ix. cap. viii. and lib. xi. cap. xviii.; Athenæus, lib. vii. cap. iii. & vi.

[4] Yarrell, 'British Fishes,' i. pp. 44–107.

the same: 'this effect has been attributed to an escape of air from the air-bladder; but no air-bladder has been found in the *Cottus*, which makes a similar noise.'

"The Lesser Weaver buries itself in the loose soil at the bottom of the water, leaving only its head exposed, and awaits its prey. If touched, it strikes upwards or sideways; and Pennant says it directs its blows with as much judgment as a fighting-cock (Yarrell, vol. i. p. 26). Fishermen assert that wounds from its anterior dorsal spines are more venomous that those caused by the spines on its gill-covers.

"As regards fighting, I should suppose that, unless some portion of the body is peculiarly adapted for this purpose, as the rostrum of the Sword-fish, or the spine on the side of the tail in the Lancet-fishes, we must chiefly look to the armature or covering of the jaws for weapons of offence.

"And this naturally leads us on to ask if, as suggested by Mr. Whitmee, 'the chief purpose served by fishes' spines is protection against the attacks of those of the class which are carnivorous.' The first inquiry is, Do the carnivorous forms most abound amongst *Acanthopterygians* or *Malacopterygians*? The spiny-rayed forms (speaking as a whole) have the teething far better developed than the soft-rayed Carps of the fresh waters, or the Herrings of the sea, the former (spiny-rayed forms) being the most carnivorous, the latter (or soft-rayed fish) being preyed upon by the former, and by the *Elasmobranchii*.

"I observed[1], 'It may not be amiss to point out that the Acanthopterygian or spiny-rayed fishes appear to be most numerous in the ocean (preying upon their articulated-rayed neighbours, the Clupeidæ, &c.); but as we examine waters more inland, the Salmonidæ or Cyprinidæ usurp their place, these latter not being possessed of spinate, but merely articulated rays. A maritime residence appears most adapted for the Acanthopterygian or spiny-rayed fishes, a fresh-water inland one to the Malacopterygians or spineless forms.'

"Spinate dorsal and anal fins being much more frequent in the carnivorous and voracious forms than in their weaker neighbours leads me to suppose that they must have some other function than protection of the fish from its enemies. One of these is probably to guard the fin-membrane from injury, for which purpose spines are much better adapted than rays in fast-swimming species. One has only to witness how commonly the spineless anal fins of Clupeoids and Siluroids are found injured in the tropics, to feel sure that much of this is owing to the absence of spinate protection. We do not see the same injury existing to any thing like a similar extent in Teleosteans whose fins are armed with strong spines; but in the intermediate forms, as the first dorsals of Sier-fishes (*Cybium*), the weak spines of the fins are frequently injured.

"Mr. Whitmee remarked that in serious attacks fish 'always turned suddenly round and lashed at one another with the caudal fin;' and he continued that he believed *serious fighting is always*

[1] 'Journal of the Linnean Society, Zoology,' vol. xiii. p. 111.

done with the tail. Here I am unable to concur. Fish, the same as other animals, when they commence to fight, employ that portion of the body most suited to such a purpose. Thus the Perch will employ his teeth, the Sword-fish his elongated snout, the Lancet-fish the spine at the side of its tail, the Siluroid may use his dorsal or pectoral spine. Instances of all these modes of attack may be referred to.

"Continuing Couch's illustration of the Stickleback, he observes, 'The bite of these little furies is so severe that I have frequently known it, when inflicted on the tail, produce mortification and, consequently, death. They also use their lateral spines (ventral fins) with such fatal effect that, incredible as it may appear, I have seen one during a battle absolutely rip his opponent quite open, so that he sank to the bottom and died.'

"That the Sword-fish employs his sword-like projection for this purpose is well known; frequent examples occur of his driving that formidable weapon into ships, whilst, according to Swainson, he is very fierce, and attacks a Whale whenever he encounters one; other observers, however, represent the Sword-fish as gentle and inoffensive except to Whales.

"The Lancet-fish as it swims past its enemy tears up an open wound.

"As regards the Siluroids we have more than one mode of attack; but I do not know of any Siluroid that employs its tail for this purpose. In one of the Siluroids of the Ohio 'the first ray of the dorsal is formed of a very strong, sharp spine, which the animal uses to kill others of a smaller size; for this purpose it gets beneath the fish it intends to attack, and then, suddenly rising, wounds it repeatedly in the belly.'

"Mr. Whitmee supposes that most carnivorous fish capture their prey by outswimming them; but to this there are numerous exceptions. The Angler, or Fishing Frog (*Lophius piscatorius*), 'while crouching close to the ground, by the action of its ventral and pectoral fins, stirs up the sand and mud; hidden by the obscurity thus produced, it elevates its appendages (situated on the upper surface of the head), moves them in various directions by way of attraction as a bait, and the small fishes approaching either to examine or to seize them, immediately become the prey of the Fisher' (Yarrell). In India we find a freshwater Siluroid (*Chaca lophioides*) which 'conceals itself among the mud, from which, by its lurid appearance, and a number of loose filamentous substances on its skin, it is scarcely distinguishable; and with an immense open mouth it is ready to seize any small prey that is passing along' (Ham. Buchanan). In March 1868 I obtained a fine example of *Ichthyscopus inermis* ('Fishes of India' p. 261), which I placed in water having a bed of mud: into this it rapidly worked itself, first depressing one side and then the other, until only the top of its head and mouth remained above the mud, whilst a constant current was kept up through its gills. It made a noise, half snapping and half croaking, when removed from its native element. This sound I consider most probably due to fear. Some fish, in

short, invariably seize their prey with their mouths, and that without calling the caudal fin into play. In fact, a stroke with the tail appears sometimes to denote contempt in fishes; it is not rare that anglers find fishes sometimes swim up to their bait, which they not only refuse, but, giving it a lash with their tail, decline to rise any more. This may, however, be a symptom of curiosity, which is largely developed in the finny tribe.

"I might multiply instances from many authors, but consider those adverted to are sufficient to show that various ichthyologists have remarked upon the emotions of anger and terror in fishes being shown by the erection of their dermal appendages and gill-covers, as well as by changes of colour, whilst terror induces some species to emit sounds that are not commonly perceived; that fishes sometimes show affection for their partners in captivity, mourning their removal; that they may be tamed sufficiently to come to a recognized sound, even to individual names that have been bestowed upon them; and that some species have an instinctive affection for their eggs and young, which they guard against intruders with the greatest determination.

"At the present time, in the Royal Westminster Aquarium, is a live example of the Electric Eel (*Gymnotus electricus*) which has in its electric organs the means of showing when it is affected by anger or terror. Some consider this curious property is for protection against Alligators; it is certainly used against fishes for the purpose of obtaining food; but when we remember how, when the Indians drive in horses and mules to the waters infested by the Eels, they immediately attack them, we must admit that such cannot be for the purpose of preying upon them, but is due to anger or terror at being disturbed."

Mr. Whitmee being unable to attend, the Secretary read the subjoined reply to Mr. Day's remarks.

"By the courtesy of the Secretary I have seen Mr. Day's comments on my paper. As I cannot attend the meeting to-morrow evening, I crave the liberty of presenting two or three written observations.

"1. My paper was written in Samoa in 1875; and my position there, of course, prevented me from having access to the whole literature of this subject. I was aware of the conduct of the Stickleback in guarding its nest, and also of similar conduct in some other fishes. But my object was to show, in opposition to a view quoted, that fishes, as a class, manifest as much feeling as most other animals. In stating that I had not met with observations showing this, I did so as an excuse for presenting a paper which I feared possessed little intrinsic value. I am glad the paper has led Mr. Day to bring forward so much evidence in confirmation of the view I advocated.

"2. Mr. Day gives a more general application than I intended to my observations about the mode of fighting with the tail. I stated an observed fact, viz. that certain fishes in my aquarium, when fighting, lashed at each other with their tails. From this I inferred

that such a mode of attack might be common among most, not all, fishes. Of course, those which possess more effective weapons in another part of the body would not resort to such a mode of warfare.

"3. As to the way in which carnivorous fish capture their prey, I said, 'doubtless *most* do it by outswimming them,' and not that *all* do this. In P. Z. S. for 1875, p. 545, I mentioned an observed fact of an *Antennarius multiocellatus* angling for small fish. Of course no one would ever imagine that the slow-moving fish mentioned by Mr. Day would outswim their prey."

1. Notes on the Anatomy of *Tolypeutes tricinctus*, with Remarks on other Armadillos. By A. H. Garrod, M.A., F.R.S., Prosector to the Society.

[Received January 14, 1878.]

The Society purchased, on the 3rd of October 1877, a young female living specimen of the Apar (*Tolypeutes tricinctus*), which was the first example of the species exhibited alive in the Gardens, and probably the first ever brought alive to this country. It was in bad health on its arrival, and, never recovering, died, without any visible lesion, on the 27th of December following. Its death has given me an opportunity of determining some of the most important points in its anatomy, which may be accepted as a supplement to Dr. Murie's valuable and elaborate memoir on *Tolypeutes conurus* in the 'Transactions of the Linnean Society' [1].

The measurements of the specimen under consideration are as follows:—

	inches.
From tip of nose to base of tail	12·55
Length of head	2·8
Length of tail	2·1

from which it is evident, on comparison with the table of measurements of the specimens in the national collection given below, that the individual was not adult, but fairly grown.

The differences between the two known species of the genus *Tolypeutes* are so slight that it may be worth while referring to them before going further. It is to M. Geoffroy Saint-Hilaire that we owe the discovery of the second species (*T. conurus*); and his most lucid description is to be found in the 'Comptes Rendus' for 1874 [2]. Therein the history of the Apar is fully expounded, references being given to all previous important accounts of the animal.

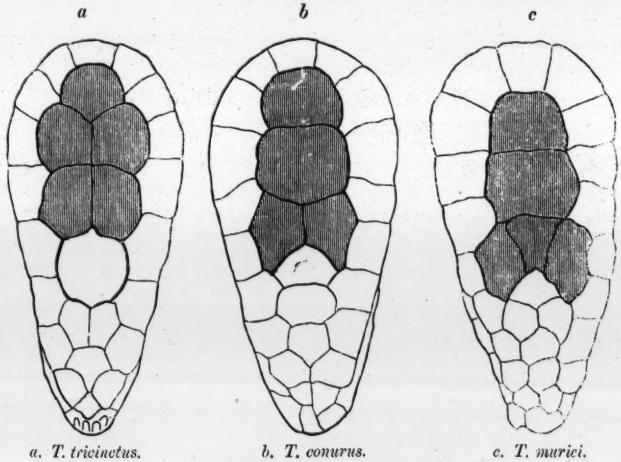
It is in the central portion of the cephalic shield that the most important peculiarities are to be seen. The marginal plates of the posterior two thirds of this shield form a regular series, and enclose other larger plates—namely, a posterior median plate, followed ante-

[1] Vol. xxx. p. 71. [2] Vol. xxiv. p. 572.

riorly in *T. tricinctus* by a pair of plates, in front of which, again, is another smaller pair.

In *T. conurus* the posterior median plate is followed by a single larger plate, and that by a pair of plates the transverse breadth of which is greater than that of the second median plate behind and in contact with it. In fig. 1, *a* and *b* exhibit these features, as well as their effect in causing the characteristic difference in the general shape of the cephalic shield of the two species—that in *T. tricinctus* being triangular, with its greatest breadth opposite the posterior of the pairs of plates, that in *T. conurus* being oval, with its greatest breadth opposite the single pair of plates.

Fig. 1.



a. *T. tricinctus*. *b*. *T. conurus*. *c*. *T. muriei*.

Cephalic shields of *Tolypeutes*.

On referring to the beautiful illustrations given by Dr. Murie of the animal dissected by him[1], the cephalic shield of which is here reproduced in outline (fig. 1, *c*), it is evident that it does not correspond with either of those above described; and I may mention that there is a skin in the national collection (Brit. Mus. spec. 140 *a*) which agrees with it. In these the posterior median plate is followed by a second larger median plate, as in *T. conurus*, and that, more forward, by a small median plate in association with two small lateral plates. The difference makes me feel justified in establishing a third species of *Tolypeutes*, based upon Dr. Murie's figure, together with the skin in the national collection above referred to, for which I would suggest the name *Tolypeutes muriei*, after the author who has

[1] Trans. Linn. Soc. vol. xxx. pl. xxxi. fig. 3.

so well described its structure. Dr. Murie's figure, being based upon a photograph of the specimen, is thoroughly reliable.

M. Is. Geoffroy St.-Hilaire has so well differentiated *T. tricinctus* and *T. conurus* that it will be necessary for me only to mention that in the former there are five toes on the fore feet (as in the Society's specimen in my possession), whilst in *T. conurus*, following the account of the discoverer of the species, there are "trois doigts seulement, avec le rudiment d'un quatrième, aux pattes antérieures (ce rudiment represente le doigt interne). Point de doigt externe." The same remarks apply to *T. muriei*; for in the specimen in the British Museum there are four toes on each fore foot, whilst in Dr. Murie's example the pollex was not present.

The tail, with its infundibuliform armature, is distally covered with four pairs of small rows of plates, arranged in longitudinal lines, there being one superior and one inferior pair, one supero-lateral and one infero-lateral. In *T. tricinctus* the whole organ is flattened from above downwards; in *T. conurus* and *T. muriei* it is not so. Two and a quarter inches appear to be its extreme length along its dorsal curve in all but the largest individuals, where it may reach two and a half inches. I do not find that the different species differ in the length of this appendage, which is correlated, as far as its length goes, with the length of the head, on the right side of which it always lies when the animal is rolled up[1].

I can find no important differences among the species in the anterior portion of the carapace. In the three free transverse semizones *T. conurus* and *T. muriei* agree, and differ from *T. tricinctus* in that the terminal or marginal lateral scutes of each zone (which with the scute above on each side of each zone are less tuberculated than the rest, to reduce the friction when the animal rolls itself up) are more detached from the second scute, are more rounded, and are smaller proportionately.

In the posterior moiety of the carapace of *T. conurus* and *T. muriei* fifteen, sixteen, seventeen, or eighteen rows of scutes can be counted along the middle line from before backwards if the marginal scutes are included in the numeration; in *T. tricinctus* I never find more than thirteen or fourteen rows.

In *T. tricinctus* only there is a triangular area composed of small scutes, with its apex directed downwards, and basally in contact with the cephalic shield, which interpolates itself between the eye and ear on each side.

The following measurements of the specimens of the different species in the national collection may prove of service in determining the proportions of each. They demonstrate that the head is decidedly shorter than the anterior moiety of the carapace in *T. tricinctus*, whilst in *T. conurus* and *T. muriei* it is nearly always longer; that in *T. tricinctus* the head is more than half the length of the posterior moiety of the carapace, whilst in the two other species it is not so much as half that measurement.

[1] Dr. Murie figures the tail on the left of the head (*l. c.*)—the photograph from which the drawing was made not having been reversed, most probably.

	T. tricinctus.	*T. tricinctus.*	*T. tricinctus.*	*T. conurus.*	*T. conurus.*	*T. conurus.*	*T. conurus.*	*T. muriei.*	*T. muriei.*
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Length of cephalic shield	3	2·9	2·9	2·75	2·75	2·75	3	3·1	?
Length of anterior shield	3·2	3·3	3·4	2·75	2·55	2·65	3·1	2·8	2·65
Length of posterior shield	5·8	5·75	5·7	5·5	5·75	5·8	6·75	6·3	6·3
Length of tail (upper aspect).	?	2·25	2·25	2·2	2·2	2·2	2·5	?	?
	B.M. 49, 3, 12, 1.	B.M. no. 140 *b*.	B.M. no. 140 *c*.	B.M. no. 140 *h*.	B.M. 52, 8, 24, 10.	B.M. 46, 9, 28, 35.	B.M. *e*.	B.M. no. 140 *a*.	Dr. Murie's specimen.

It should also be mentioned that in *T. tricinctus* there is much more hair on the carapace at the posterior margins of the scutes than in the two other species, and that it has only eight teeth on each side of each jaw, whilst both in *T. conurus* and in *T. muriei* there are nine.

All the specimens of the genus *Tolypeutes* agree, as far as my experience goes, in the manner in which their cervical vertebræ ankylose—the atlas, together with vertebræ 5, 6, and 7 alone being free.

Concerning the geographical distribution of the genus *Tolypeutes*, the localities whence both Dr. Murie's and my specimen were obtained cannot be determined, they having been both purchased of dealers.

The specimen 140 *a* in the British Museum, of *T. muriei*, was presented by Burnett and Fitzroy, and therefore must have probably come from some part of the coast of La Plata or Patagonia.

A national specimen of *T. conurus* is marked as having come from Bolivia. Another of the same species, in the museum of the Royal College of Surgeons, was presented by Mr. Darwin.

The type specimen of *T. conurus* was obtained in the province of Santa Cruz de la Sierra, Bolivia; and for a cast of its cephalic shield, from which I have been able to determine the correctness of the nomenclature above adopted, I have to express my very best thanks to Professor Alphonse Milne-Edwards.

The species described by Burmeister[1] from Buenos Ayres is *T. conurus*.

Azara found a four-toed species in Paraguay; it was therefore not *T. tricinctus*.

The brain of no species of *Tolypeutes* has been described, Dr. Murie having met with an accident with his specimen. By Gervais a cast is figured of the interior of the skull, which demonstrates the

[1] Anales del Museo Publico de Buenos Ayres 1871 tom. ii. p. 117.

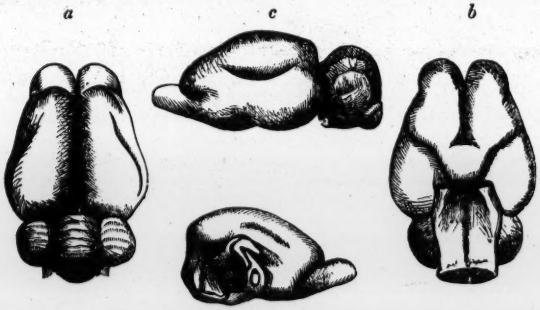
large size of the olfactory lobes[1], together with its general proportions, and but little more.

Our knowledge of the brain of the Dasypodidæ has been much increased by a paper from the pen of Prof. Turner in the first volume of the 'Journal of Anatomy and Physiology'[2] on the brain of *Dasypus sexcinctus*, in which the bibliography of the subject is fully given.

The general appearance of the brain of *Tolypeutes tricinctus* differs but little from that of *Dasypus sexcinctus*, whilst in surface-markings it much more closely resembles that of *Tatusia peba*, as figured by Rapp[3], being comparatively simple in its gyration. There is not that difference in the breadth of the anterior and posterior portions of the cerebral hemispheres which is found in *Dasypus sexcinctus*.

The Sylvian fissure is only represented by an open and very shallow angle, above which, on the surface of the hemisphere, is a slight, partly encircling, shallow groove of some length, separated from it by a very short distance (*vide* fig. 2, *c*).

Fig. 2.



Brain of *Tolypeutes tricinctus*.

The large olfactory lobes are are much broader than they are deep.

On the surface of each cerebral hemisphere there are two sulci. One of these, the anterior, is horizontal, and divides the frontal lobe into an upper and a lower part. Its outer extension is nearly to the lateral margin, not going backwards more than one fifth the length of the hemisphere. Internally it ceases on the flat interhemispheral surface as far backward as its outer end (*vide* fig. 2, *a*).

The second sulcus is upon the superior cerebral surface, running from behind forwards and inwards. Posteriorly it commences at the outer posterior angle of the hemisphere a short distance from its ex-

[1] "Les formes cérébrales des Edentates," Nouv. Archiv. du Muséum, 1869, tom. v. pl. ii. fig. 8.

[2] 1867, p. 313.

[3] Edentaten, tab. viii. fig. 3.

tremity. It does not, therefore, turn round the posterior end of the hemisphere to become continuous with the fissure of the hippocampus, as it does in *Dasypus sexcinctus*. Anteriorly it ceases in the middle of the superior surface of the frontal lobe, a short distance behind the convex margin of its upper moiety, and at about the transverse level of the ends of the anterior sulcus. The general direction of this sulcus is horizontal when viewed from the side, it being slightly curved, with its convexity downwards.

The sulcus present on the superoparietal cerebral surface of *Dasypus sexcinctus* is entirely absent in *Tolypeutes tricinctus*.

The internal cerebral surface very closely resembles that of *Dasypus sexcinctus* as figured by Prof. Turner. The corpus callosum is short, pointed in front, inclined obliquely upwards and backwards, being rounded and thick posteriorly, where it becomes continuous with the psalterium of the fornix. The anterior commissure is well developed. The sides of the corpus callosum are very much upturned. The calloso-marginal sulcus is feebly represented, being of about the length of the corpus callosum, and situate at a level a little anterior to it (*vide* fig. 2, *d*).

The corpora quadrigemina are large, and separated by a deep longitudinal fissure, the pineal gland being extremely small. In the natural position of the spirit-preserved specimen it was quite impossible to cover the testes by the posterior margins of the cerebral hemispheres, which leads me to think that Prof. Turner is hardly justified in his correction of Tiedemann, Cruveilhier, and Stannius, who all say that the corpora quadrigemina are uncovered by the cerebrum (in part at least) (*vide* fig. 2 *a*).

The median and lateral lobes of the cerebellum are nearly equal in size. The medulla is very large, and the fifth nerve is enormous. The optic nerves and commissure are insignificantly small. I could not see any corpora albicantia.

With reference to the visceral anatomy of *Tolypeutes tricinctus*, the *tongue* was $2\frac{1}{4}$ inches long in my specimen, and ·4 inch broad at the base. It is soft and elongate-triangular (lanceolate) in shape, flattened above. No circumvallate papillæ are visible, the others being inconspicuous and uniformly distributed. On the *palate* there are nine larger and smaller transverse ridges on each side, the interval between the last pair of molar teeth being smooth. The number of teeth is eight above and seven below, on each side.

The epiglottis is slightly indented by a notch in the middle line; and the soft palate embraces it, so that the rima glottidis opens into the posterior nares, as in so many mammals, during ordinary respiration. A tonsilitic pit exists on each side of the fauces.

The *lungs* are divided into four lobes on the right side, and two on the left. In most Dasypodidæ there are three lobes on the left side; but in the animal under consideration the two upper were blended. Three is said by most authors to be the number of lobes of the right lung; but I always find a fourth azygos lobe as well, hidden behind the heart, in the genera *Dasypus* and *Xenurus*, absent in *Tatusia*. Dr. Murie's figure of the lungs scarcely differs, ex-

cept in the absence of division of the left upper lobe, from my specimen.

The *stomach* is of the ordinary shape, with but a short lesser curvature. It is muscular, but not powerfully so, at its pyloric end. Along its greater curvature, when laid out flat, it measures 6¼ inches.

The liver has the lateral fissures deep, whilst the umbilical fissure is comparatively insignificant. The gall-bladder is partly, but not deeply, embedded in the abdominal surface of the right central lobe. The Spigelian lobe forms a short rounded cone, very broad at its base. According to the method elsewhere suggested by me[1], the formula of the bulk of the lobes is thus expressed:—

$$\text{L.L. } 1\tfrac{1}{2} > \text{R.C.} > \text{R.L. } 2 > \text{L.C. } 2 > \text{C.}$$

The small intestines measure 75 inches, the large intestine 6·5 inches. There are no cæca; but there is an abrupt change in the diameter of the alimentary canal at the ileo-cæcal valve, as in *T. conurus* and in the genus *Tatusia*.

The *uterus* is triangular, the fundus being perfectly straight when viewed from in front, and the Fallopian tubes joining it at the extreme upper and outer angles. The conical clitoris is an inch long; and the genito-urinary orifice is a longitudinal slit 0·3 inch from its apex.

Among the various papers on the visceral anatomy of the Dasypodidæ I may refer to Hunter's description of *Tatusia peba*[2], Professor Owen's account of the same species, and of *Dasypus sexcinctus*[3], and Hyrtl's monograph of *Chlamydophorus truncatus*[4]. To these I may add my own notes on *Xenurus unicinctus*, together with those upon the other species which have passed through my hands, as an assistance towards the determination of the affinities of *Tolypeutes*.

In *Xenurus unicinctus* the gall-bladder is so deeply embedded in the tissue of the right hepatic lobe that it nearly penetrates to its diaphragmatic surface. This I find to be the case in *Dasypus villosus*, *D. sexcinctus*, and *D. vellerosus*; whilst in *Tatusia hybrida* and *Tolypeutes tricinctus* it is much less sunk. The cystic duct is very much twisted in a corkscrew manner. The proportional bulk of the hepatic lobes is almost exactly the same as in *Tolypeutes tricinctus*. In *Tatusia peba* and *T. hybrida* the right central lobe is the largest, not the left lateral. In *Tatusia* the umbilical fissure is less significant than in *Dasypus*, *Xenurus*, or *Tolypeutes*.

The junction of the large and small intestines in *Xenurus* is as in *Tatusia peba* and *T. hybrida*, there being no cæcal dilatations, as there are in *Dasypus villosus*, *D. sexcinctus*, *D. minutus*, and *D. vellerosus*.

The following measurements of the intestines demonstrate their relative lengths:—

[1] P. Z. S. 1875, p. 57.
[2] 'Essays and Observations on Natural History,' 1861, vol. ii. p. 182.
[3] P. Z. S. 1831, pp. 141 and 154, and P. Z. S. 1832, p. 130.
[4] Denkschr. der kais. Akad. Wien, ix. 1855.

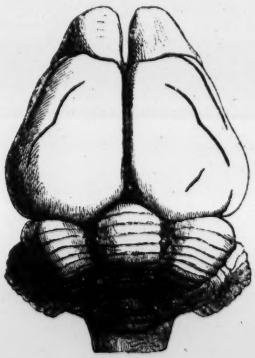
	Tatusia peba, adult ♂.	*Tatusia peba*, adult ♀.	*Xenurus unicinctus*, ♂.	*Dasypus villosus*, ♂.	*Dasypus minutus*, ♀.	*Dasypus velerosus*.
	ft.	ft.	ft.	ft.	ft.	ft.
Small intestine.....	16·3	14·6	18·5	11·5	5·1	4·3
Large intestine.....	1·5	1·5	1·6	1·25	7·0	0·66

In *Xenurus unicinctus* the vesiculæ seminales are not present, the distal ends of the ureters being enlarged. Cowper's glands and a prostate are present; and the apex of the glans penis is not trilobed as in *Tatusia*, but simple, as in *Dasypus* and *Tolypeutes*. The penis itself is huge. In *Tolypeutes*, according to Dr. Murie, the vesiculæ seminales are also absent.

In *Tatusia peba* and *T. hybrida* the vesiculæ seminales are large, and there is a pair of lateral lobes to the apex of the glans penis. The whole penis is proportionally smaller in *Tatusia* than it is in *Dasypus*, as is the clitoris. In these respects *Tolypeutes* and *Xenurus* agree with *Dasypus*, my experience being, as far as the male organs of *Dasypus* are concerned, confined to *D. sexcinctus*.

In *Dasypus*, *Tolypeutes*, and *Xenurus* there are only a pair of nipples, in *Tatusia* there are two pairs. In *Xenurus unicinctus* the uterus is triangular, as in *Dasypus* and *Tolypeutes*.

Fig. 3.



Brain of *Xenurus unicinctus*.

The brain of *Xenurus* is intermediate in its form and surface-markings between *Dasypus* and *Tolypeutes*. The hemispheres, when

viewed from above, are considerably broader posteriorly than anteriorly, as in *Dasypus*. The olfactory lobes are large; and the corpora quadrigemina are completely covered. The oblique sulcus on the back part of the superior surface of each hemisphere, which runs forwards and outwards, is present, as in *Dasypus*, but it is very short. The two other sulci are well developed, that in the frontal portion being longer than in either *Dasypus* or *Tolypeutes*. The upper or second sulcus runs from in front—near the anterior internal angle of the superior surface of the hemisphere—backwards and outwards for some distance, but not nearly as far as the posterior margin of the cerebrum, it ceasing a little behind the level of the outer extremity of the posterior oblique sulcus. In this respect it resembles *Tolypeutes* and differs from *Dasypus* (*vide* fig. 3).

It is to Prof. Owen that we are indebted for our knowledge of the great differences between the colic cæca and female generative organs of the genera *Tatusia* and *Dasypus*. These facts, when taken in association with other characters above brought forward and referred to, may be thus tabulated:—

Dasypus.	*Tolypeutes.*	*Xenurus.*	*Chlamydophorus.*	*Tatusia.*
Ears apart.	Ears apart.	Ears apart.	Ears apart.	Ears approximate.
Nipples 2.	Nipples 2.	Nipples 2.	Nipples 2.	Nipples 4.
Uterus triangular.	Uterus triangular.	Uterus triangular.	Uterus pyriform.	Uterus pyriform.
External genitalia enormous.	External genitalia enormous.	External genitalia enormous.	External genitalia small in female.	External genitalia not excessive.
Glans penis simple.	Glans penis simple.	Glans penis simple.	?	Glans penis trilobed.
Vesiculæ seminales absent.	Vesiculæ seminales absent.	Vesiculæ seminales absent.	?	Vesiculæ seminales present.
Lateral colic cæca present.	No colic cæca.	No colic cæca.	Lateral colic cæca present.	No colic cæca.
Azygos lobe of lung present.	Azygos lobe of lung present.	Azygos lobe of lung present.	Azygos lobe of lung present (Hyrtl).	Azygos lobe of lung absent.

Thus we may infer that the genera *Dasypus*, *Tolypeutes*, and *Xenurus* resemble one another more than any of them do *Tatusia*. *Chlamydophorus*, in other respects so different from them all, is like *Dasypus* alone in its colic cæca, like *Dasypus*, *Tolypeutes*, and *Xenurus* in most respects, and like *Tatusia* only in the shape of its uterus.

2. Notes on a Specimen of *Polyborus* lately living in the Society's Gardens. By J. H. Gurney, F.Z.S.

[Received Jan. 17, 1878.]

The Society's 'Proceedings' for 1876 contain at p. 333 a plate and a concise notice of two remarkable *Polybori* which were said to have been obtained in Patagonia, and which were placed in the Gardens on the 2nd of March of that year.

On the 27th of May, 1877, one of these birds unfortunately died; and on examining the skin of this specimen, which proved on dissection to be a male, I have noticed the following points.

The wing measures 15·6 inches; but the ends of the primaries are worn considerably, and except for this the measurement would, I think, have exceeded 16 inches; the length of the tarsus is 3·7, and that of the middle toe *s. u.* 2·3 inches.

I have had the opportunity of comparing these measurements with those of four specimens of *Polyborus tharus* which have been kindly lent to me by Messrs. Salvin & Godman, and with those of two specimens in the Norwich Museum; also with the measurements given by Mr. Sharpe, at p. 32 of the first volume of his Catalogue, of two others in the British Museum.

Unfortunately in none of these eight examples is the sex recorded; but the result appears to prove that *Polyborus tharus* is subject to considerable variation of size, which further investigation may show to be incident, in part, to the different localities from which the specimens have been obtained.

The following are the measurements alluded to:—

In the collection of Messrs. Salvin & Godman.	Wing.	Tarsus.	Middle toe *s. u.*
Bahia	14·8	3·0	1·9
,,	15·1	3·5	2·2
,,	15·6	3·5	2·1
Supposed to be from Bolivia	16·0	3·5	2·2
In the Norwich Museum.			
Locality unknown	17·2	3·7	2·3
,,	17·4	3·9	2·1
In the British Museum, as given by Mr. Sharpe.			
Locality not quoted	15·5	3·8	
,,	17·9	3·8	

It will be seen from the above measurements that there is nothing in the dimensions of the specimen which died at the Gardens to show that it is not an abnormal example of *P. tharus*; and although the extraordinary paleness of the ground-colour of its plumage presents a curious difference from the coloration of the same portions of the plumage in *P. tharus*, the form and disposition of the markings in great measure agree with those of that species in its immature stage.

The following notes refer to the details in which the pale specimen agrees with the ordinary *P. tharus* in its immature stage:—The upper part of the head, including the occipital crest, is decidedly darker than the adjacent plumage; the ear-coverts are whole-coloured and of a castaneous tint; the feathers of the throat and upper breast have strongly marked longitudinal shaft-marks; and similar shaft-marks, but narrower and fainter, are perceptible on the lower breast

and on the interscapular feathers. All these shaft-marks resemble greatly in shape those on the corresponding portions of the plumage in the normal immature *P. tharus*; but in the latter the shaft-marks are paler than the sides of the feathers, while in the pale Patagonian specimen they are darker and more rufous. In the last-named bird faint transverse marks of a similar rufescent tint, but very pale, are perceptible on the abdomen and under tail-coverts; similar transverse marks, but darker, less rufous and more numerous, are apparent in a specimen of *P. tharus* in Messrs. Salvin & Godman's collection, marked "Bolivia?," which seems to me to be passing from the immature to the adult stage. Transverse bars alternately dark and pale and of a similar character are found on the lower part of the back in *Polyborus tharus* in all its stages; and these markings, though modified in their coloration, especially by the substitution of dull fulvous bars for those of blackish brown in ordinary specimens, are unmistakably present in the pale specimen under consideration.

The latter bird was moulting its primaries when it died; and I observe that the transverse bars on the new quill-feathers are broader than on the old, the latter agreeing in general character with the corresponding bars in immature specimens of the normal *P. tharus*, and the former with the same bars in adult birds. These bars are much more rufous, especially on the newly acquired feathers, than is the case in normal specimens; in the latter they are of various shades of brown, but not tinged with rufous.

The narrow transverse bars on the upper surface of the tail are less distinct in the Patagonian pale bird than in ordinary specimens of *P. tharus*; but they are similar in character and of about the same number (from 15 to 16). The broad terminal blackish-brown band at the end of the tail in the ordinary bird is represented in the pale one by a dull fawn-coloured band of similar dimensions tinged with rufous on its upper edge and on the external webs of the outer pair of rectrices [1].

During a recent visit to the Zoological Society's Gardens, I observed that the bare skin on the face of the survivor of the two pale birds, changed rapidly from carmine-red to pale pink; but Mr. Bartlett informed me that in neither of the pale specimens did these occasional and transient changes assume a wider range, and that in them the bare skin never became yellow, as may be sometimes seen to be the case (even to the extent of a decided lemon-colour) in the normal specimens of *Polyborus tharus* inhabiting the adjacent cages.

On the whole, I incline to agree with the opinion expressed by Mr. Sclater in his original notice of this curious pair of birds, that they are "young individuals of *P. tharus* in an abnormal phase of plumage," or, as I would rather say, of colouring generally.

[1] The tail in the pale birds was imperfect when they were drawn for the plate in the Proc. Zool. Soc.; but the specimen under consideration obtained its full tail subsequently.

3. A Study of the Pteroclidæ or Family of the Sand-Grouse. By D. G. Elliot, F.R.S.E. &c.

[Received January 18, 1878.]

The materials for the present paper were supplied by the splendid collection in the Paris Museum, kindly placed at my disposal by Prof. A. Milne-Edwards, who afforded me every facility for investigating this interesting group of birds, and to whom, as well as to Dr. E. Oustalet, Aide-Naturaliste, I desire to express my thanks. With the exception of *P. decoratus*, the type of which is, I believe, unique, every known species of the Pteroclidæ is represented in that Museum, many of them by series of both sexes in different plumages; and certain specimens are the types of the older writers. In the treatment of my subject I have followed the same method as that adopted for my "Review of the Ibidinæ"[1], and give first the Literature of the Family, then the Classification, followed by some remarks upon the different genera proposed for the group; these are succeeded by a review of the Geographical Distribution; and I conclude with the synonymy and description of each species.

Literature of the Family.

Linnæus is the first author to claim our attention.

1766. Linnæus, 'Systema Naturæ.'
In the list of species comprised in the genus *Tetrao*, this author places among those characterized by "*pedibus nudis*" a single species belonging to the Pteroclidæ, called by him *Tetrao alchata*. Species 1.

1771. Linnæus, 'Mantissa.'
In this work the *P. senegalus* is described as *Tetrao senegalus*. Species 2.

1773. Pallas, 'Reise durch Verschied. Provinz. Russisch. Reichs.'
Syrrhaptes paradoxus is described as *Tetrao paradoxus*. Species 3.

1774. Pallas, 'Nov. Comm. Petropol.'
Pterocles arenarius first made known as *Tetrao arenarius*. Species 4.

1786. Scopoli, 'Deliciæ Faunæ et Floræ Insubricæ.'
Pterocles fasciatus first described as *Tringa fasciatus*. Species 5.

1788. Gmelin, 'Systema Naturæ.'
Five species of this family are given by this author, all placed in Linnæus's genus *Tetrao*, viz. *T. alchata*, Linn., *T. namaqua*, described for the first time, *T. indicus* (=*T. fasciata*, Scop.), *T. arenarius*, Pall., and *T. paradoxus*, Pall. Species 6.

[1] P. Z. S. 1877. p. 477.

1815. Temminck, 'Histoire Naturelle Générale des Pigeons et Gallinacés,'

A general review of the Pteroclidæ is here given, as known to the author, with some species renamed that were previously described. They are as follows:—*P. arenarius*, Pall., *P. bicinctus*, *P. quadricinctus*, both described for the first time, *P. setarius* (=*T. alchata*, Linn.), *P. tachypetes* (=*T. namaqua*, Gmel.), and *Syrrhaptes pallasii* (=*T. paradoxa*, Pallas). Species 8.

1817. Vieillot, 'Nouveau Dictionnaire d'Histoire Naturelle.'

In his genus *Œnas* are here included such species of this family as were known to the author, viz. *Œ. cata* (=*T. alchata*, Linn.), *Œ. bicincta*, *Œ. indica* (=*T. fasciata*, Scop.), *Œ. namaqua*, and *Œ. arenaria*. No new species are described.

1822. Burchell, 'Travels in South Africa.'

Pterocles variegatus first described. Species 9.

1823. Lichtenstein, 'Verzeichniss der Doubletten des zool. Museum zu Berlin.'

Pterocles coronatus first described. Species 10.

1825. Temminck, 'Planches Coloriées.'

Pterocles exustus and *P. lichtensteini* first described and figured. In an earlier portion of the work, in the 9th livraison (1823), *P. arenarius* is figured ♂ and ♀; and in the 57th livraison (1825) a representation of both sexes of *P. coronatus* is given. Species 12.

1837. Swainson, 'Birds of West Africa.'

Pterocles quadricinctus, Temm., renamed *P. tricinctus*.

1843. Gould, in the 'Voyage of the Sulphur, Birds.'

Pterocles personatus described. Species 13.

1849. Smith, 'Illustrations of South-African Zoology.'

Pterocles gutturalis described. Species 14.

1850. Gould, in 'Proceedings of the Zoological Society of London.'

Syrrhaptes thibetanus described. Species 15.

1856. Bonaparte, in 'Comptes Rendus.'

In his Table des Galinacés, Bonaparte proposes the genus *Pteroclurus* for certain species of this family, of which the *T. alchata*, Linn., may be considered as the type.

1870. Cabanis, in 'Von der Decken's Reise.'

Pterocles decoratus described. Species 16.

Classification.

The natural position of the Pteroclidæ (called by Prof. Huxley Pteroclomorphæ), in the Class Aves, is between the Columbidæ (Peristeromorphæ) on the one hand, and the Tetraonine series of the

Gallinaceous birds (Alectoromorphæ) on the other, supplying the link which connects these two great divisions, and with them constitutes the Gallo-Columbine series. The Pteroclidæ resemble the Alectoromorphæ in their skull, palatines, maxillo-palatines, and bill; but the pterygoid and basipterygoid processes, sternum, furcula, coracoid, and fore limb are like those of the Pigeon. The foot, with its almost absent hallux (entirely wanting in *Syrrhaptes*), and the short tarso-metatarsus are, however, very unlike a Pigeon's. The vocal organs, as shown by Mr. Parker[1], are the same as a Pigeon's; the trachea is cartilaginous, and possesses a pair of laryngeal muscles at its bifurcation; but the crop, gizzard, gall-bladder, and small intestines are like those of Gallinaceous birds. The cæca coli are very voluminous, but have twelve continuous longitudinal folds in their mucous membrane, instead of seven as in *Lagopus*. The proventricular glands, however, are Pigeon-like. The pterylosis of the Sand-Grouse, although very similar to that of a Pigeon, differs somewhat on its dorsal surface. The lateral neck-spaces are shorter, only reaching to the beginning of the neck; the superior wing-space is absent; the lumbar tracts coalesce with the posterior part of the dorsal tract, which latter also joins the plumage of the tibia. In some species the narrow spinal tract is wanting. The Pteroclidæ also differ from the Pigeons in possessing an after-shaft on the contour feathers, and from the Gallinaceous birds in having a naked oil-gland.

From the above it will be clearly seen how intermediate these singular birds are of the two great groups between which they are placed. In some of their characters they are also pluvialine, and their flight is especially Plover-like; but in their method of drinking they resemble the Pigeons, as the bill is thrust up to the nostrils into the water, and retained there until the bird's thirst is allayed. The members of the two genera adopted for this family closely resemble each other in their outward shape, being generally rather heavy of body, with long pointed wings and extremely short legs and toes, apparently quite disproportionate in size to the rest of the bird. The species, therefore, are awkward when on the ground, run clumsily, and appear to great disadvantage; but on the wing they move rapidly and gracefully. The bill, though small, is strong and Grouse-shaped; in *Pterocles* the tarsi are feathered in front; in *Syrrhaptes* both tarsi and toes are completely covered with feathers, as in the winter coat of the Ptarmigan. I have arranged the members of *Pterocles* in two divisions, distinguished by the presence or absence of a conspicuous band across the breast. The first of these, without a pectoral band, contains five species, all but one having the breast of a uniform coloration.

The second division, with a pectoral band, possesses nine species, having, as a rule, a very different style of coloration from those in the other section of the genus. In the remaining genus *Syrrhaptes*, but two species are as yet known, separated in their outward appearance from their relations in *Pterocles* by the feathered leg and foot

[1] Trans. Zool. Soc. vol. v. p. 204.

and the entire absence of a hind toe. One character by which *Syrrhaptes* was formerly distinguished was the extremely lengthened filamentous first primary observed in *S. paradoxus*; but since the discovery of the second species, which does not possess a similar formation, this peculiarity will not answer as a means of generic distinction. Both species of *Syrrhaptes* have the median rectrices much lengthened beyond the rest; but as this also occurs with several species of *Pterocles*, it cannot be regarded as of generic importance.

Genera.

But few generic terms fortunately have been proposed for these birds. Usually placed by the older authors, who were misled by their feathered tarsi, in *Tetrao*, they were first separated from the Grouse by Temminck, who, in 1815[1], created for them the term *Pterocles*. In 1811 Illiger proposed *Syrrhaptes* for the *Tetrao paradoxa* of Pallas, separating it from the other species of the family. In 1812 Fischer instituted the term *Nematura* for the same bird, followed in 1816 by Vieillot with *Heteraclitus*, and also with *Œnas* for the other members of the family. Lastly Bonaparte, in 1856, created the term *Pteroclurus*. Two generic forms are evidently represented among the Pteroclidæ, for which the terms *Syrrhaptes*, of Illiger, to contain the two species *S. paradoxus* and *S. thibetanus*, and *Pterocles* of Temminck to include all the rest of the family, have the claim of priority, and are amply sufficient for the recognition of the generic divisions now existing. In the osteology of the two genera there are considerable differences observable, as has been well shown by Mr. Parker, some of which are the following:—The skull of *Syrrhaptes* is weaker, less gallinaceous, and more pigeon-like than that of *Pterocles*; the upper frontal region is narrower between the eyes, and the alæ of the ethmoid are less swollen between the crura of the nasal. In *Pterocles* the bones of the face are as strong as is observed in a Pigeon; the lower jaw is stronger than in *Syrrhaptes*, and bends further back; the postorbital and squamosal processes are stronger, as is also the malar arch; in some characters of the skull and skeleton they are nearly alike. *Pterocles* has the scapula more like that of a Grouse, and also possesses one more caudal vertebra than *Syrrhaptes*, and the styliform and sacral ribs have no appendage; but both genera have a rudiment attached to the last hæmapophysis. The sternum is stronger, with the episternum and hyosternal processes as in *Syrrhaptes*; but the external hyposternal processes are shorter.

Of fossil remains of Pteroclidæ but two tarso-metatarsal bones have been found, which have been described by Prof. A. Milne-Edwards, in his great work 'Les Oiseaux Fossiles,' as *Pterocles sepultus*. By the kindness of their possessor I have had an opportunity of examining

[1] In his 'Manuel d'Ornithologie' (1820), 2nd part, p. 474, in a footnote, Temminck states that he published an account of these birds under the generic name of *Pterocles* in 1809. I have not been able to find this publication, nor any record of it, and 1815 is the earliest date I can assign to the genus.

these interesting specimens. There is a slight difference observable in their size, one being rather stouter than the other; and they evidently belong to two individuals, perhaps different sexes of the same species; and, as stated by Monsieur A. Milne-Edwards[1], represent a species between the *P. alchata*, Linn., and the *P. gutturalis*, Smith.

The following are the genera proposed for these birds, with the type of each added:—

		Type.
(1811)	*Syrrhaptes*, Illiger, Prodr. p. 243	*Tetrao paradoxus*, Pall.
(1812)	*Nematura*, Fisch. Mém. Soc. Natur. Moscou	*Tetrao paradoxus*, Pall.
(1815)	*Pterocles*, Temm. Man. Ornith. p. 299.....	*Tetrao alchata*, Linn.
(1816)	*Œnas*, Vieillot, Analyse, p. 52	*Tetrao alchata*, Linn.
(1816)	*Heteraclitus*, Vieillot, Analyse, p. 53	*Tetrao paradoxus*, Pall.
(1856)	*Pteroclurus*, Bon. Compt. Rend. xlii. p. 880	*Tetrao alchata*, Linn.

Geographical Distribution.

The Pteroclidæ have been found in only three of the zoogeographical divisions of the earth's surface, viz. the Palæarctic, Oriental, and Ethiopian regions; and in these they are chiefly restricted to tracts devoid of cultivation, or actual deserts. From the fact that of the sixteen known species twelve are met with in the Ethiopian region, we may safely regard the Pteroclidæ as having originated in Africa, from which they spread into the other two regions named above. Of the twelve Ethiopian species, seven (or a little over half) are not found in the other zoogeographical divisions. In the Oriental region, which is the next richest in the birds of this family, seven species are found, one of which is peculiar to it; and, lastly, the Palæarctic region is tenanted by five species, two of which, constituting the genus *Syrrhaptes*, are not found elsewhere. Commencing with the Ethiopian region, where the species appear confined mainly to the eastern side of the continent, we find the *Pt. gutturalis* extending its range from Abyssinia to Kurrichane, just north of the Cape Colony, where it was procured by Sir A. Smith. In Egypt and Nubia *Pt. coronatus* is found, not going south of the last-named country on this coast. It is also met with in the southern part of the desert of Sahara, and again on the plains of the Sinaitic peninsula, and probably occurs throughout Arabia, as, together with the three species next mentioned, it is found in Sindh of the Oriental region. In the region extending from and including Egypt to the Somali country *Pt. exustus*, *Pt. senegalus*, and *Pt. lichtensteini* are found; while *Pt. quadricinctus* appears to be restricted to Abyssinia and Sennaar, although given by Swainson as a bird of West Africa under the name of *Pt. tricinctus*. Passing southwards along the same coast, we find *Pt. variegatus*, *Pt. namaqua*, and *Pt. bicinctus* inhabiting the Trans-Vaal, whence they range across this part of the continent into Damaraland. Somewhere in the interior of Eastern Africa *Pt. decoratus* dwells, according to Cabanis; but its precise distribution does not appear

[1] Oiseaux Fossiles, tom. ii. p. 295, pl. 141. figs. 1–9.

to be exactly known. The type and only known specimen was obtained near Lake Jipe. It is most probable that the range of some of the species mentioned above may be much greater; but before this can be definitely determined our knowledge of the interior of the continent and its avi-fauna must be greatly increased. *Pt. exustus* is given by Hartlaub, in his 'System der Ornith. West-Afrika's,' upon the authority of a specimen in the Berlin Museum, as an inhabitant of Senegal. I have not seen this corroborated by any other writer; and the species seems to be more particularly a bird of East Africa, although it is not unlikely that it may skirt the southern border of the Sahara quite across the continent. Finally, according to Tristram, *Pt. arenarius* is found everywhere in the Sahara, except in the extreme south. In the Oriental region, the next in order, we find that in Sindh, with the exception of *Pt. decoratus* and *Pt. quadricinctus*, all of those species already mentioned as dwelling in the Ethiopian region are met with, two of which (*Pt. coronatus* and *Pt. lichtensteini*) do not seem to be found in any other part of India. *Pt. senegalus* is met with along the shores of the Runn of Cutch and in Northern Guzerat; while *Pt. arenarius* goes north into the Punjaub and thence through the North-west Provinces; and *Pt. alchata* occurs in the Peshawur valley. *Pt. exustus* and *Pt. fasciatus* are distributed generally throughout India, the last-named species not being found in Sindh.

The last zoogeographical region in which these birds occur is the Palæarctic; and commencing in the far east we have the members of the genus *Syrrhaptes*; of which *S. paradoxus* ranges from the plains of Pekin and Tientsin, through Mongolia and the Great Gobi desert into the Kirghis steppes, occasionally wandering into parts of Western Europe in more or less extensive numbers. The year 1863 was a notable one for a great migration of this species, flocks of considerable size having been observed as far west as Ireland. The only other known species, *S. tibetanus*, is distributed from the Kokonor basin on the east, through Northern Thibet to Ladakh. In this region also, *Pt. senegalus* is a native of Palestine, where, according to Tristram, it is numerous. *Pt. arenarius* is common throughout Turkestan, and is not rare in the eastern steppes of New Russia and the Caucasus. It is also met with in Persia and about Erzeroom, not uncommon in Palestine, and is distributed generally throughout south-western Europe, being common in Spain and Portugal. It is also a dweller of the Algerian deserts, whence it extends into the Ethiopian region as already enumerated, and has also been obtained in Greece. Its most western locality that I have seen recorded is the Canary Islands, where it has been observed in the Gran Canaria. The only remaining species to be noticed in the Palæarctic region is *Pt. alchata*, which ranges from the Kirghis steppes into southern Russia; it is common in Asia Minor and Palestine, and occurring throughout Southern Europe, is found in France where *Pt. arenarius* is not known. It is also common in Spain, and frequently met with in Portugal, and is abundant in the Algerian deserts. It has been

obtained at Malta, and also in Greece, where, according to Von der Mühle, a specimen has been procured in Eubœa.

Genus Pterocles.

Body rather long and heavy; bill rather stout; culmen curved; groups ascending; sides of mandibles compressed. Nostrils basal, open, oblong, partly covered by a membrane; frontal feathers projecting over, but not intruding upon, the nasal aperture. Wings long, pointed; first primary longest. Tail cuneate; median rectrices sometimes lengthened beyond the rest. Tarsi short, covered anteriorly with downy feathers; feet small, bare, the hallux extremely short, almost obsolete, not reaching the ground.

Key to the Species.

A. Without pectoral band.
- *a.* Front and chin black ..... 1. *Pt. personatus.*
- *b.* Loral space black; throat yellowish, bordered on its lower edge with a band of black; breast greenish-grey; abdomen chestnut ..... 2. *Pt. gutturalis.*
- *c.* Stripe on each side of forehead, from nostril to above the eye, chin, and centre of throat black 3. *Pt. coronatus.*
- *d.* Lores and band encircling back of head pearly-grey; cheeks, ear-coverts, and throat orange yellow; centre of abdomen black ..... 4. *Pt. senegalus.*
- *e.* Top of head yellowish-brown, streaked with black; throat pearly-grey; underparts rufous, spotted with white..... 5. *Pt. variegatus.*

B. With pectoral band.
- *a.* Without black bar on forehead.
  - *a'.* Median rectrices not lengthened much beyond the rest.
    Upper part of throat and sides of neck rufous; lower portion of throat black; band on lower part of breast; abdomen and flank black ..... 6. *Pt. arenarius.*
  - *b'.* Median rectrices greatly lengthened beyond the rest.
    - *a''.* Throat yellow; black band across breast; abdomen and flanks chestnut ..... 7. *Pt. exustus.*
    - *b''.* Throat and stripe behind the eye black; sides of throat rufous; centre of breast chestnut, bordered above and below with black; rest of underparts white ..... 8. *Pt. alchata.*
    - *c''.* Throat orange-yellow; breast crossed by a white and a chestnut band; abdomen rufous brown ..... 9. *Pt. namaqua.*
- *b.* With black bar across forehead.
  - *a'.* Breast uniform greenish buff.
    - *a''.* Lower part of breast bordered with a chestnut band, succeeded by a white one; rest of underparts yellowish-white, barred narrowly with black; wing-coverts with two black bands, margined on the upper side only with white ..... 10. *Pt. fasciatus.*

b''. Lower part of breast bordered with a rather broad white band, succeeded by a broad black one; rest of underparts yellowish-white, irregularly barred with black ..... 11. *Pt. bicinctus.*

c''. Lower part of breast crossed by four bands, first a maroon one, succeeded by a white one, then a black, and lastly a white one, alternating; wing-coverts with only one black band, margined on both sides with white ..... 12. *Pt. quadricinctus.*

b'. Throat pale buff; upper part of breast buff, crossed with numerous narrow black bars; middle of breast uniform buff, crossed in centre by a narrow black bar, and another of the same hue on its lower edge; rest of underparts yellowish-white, barred narrowly with black... 13. *Pt. lichtensteini.*

c. Black bar on forehead, divided in the centre by a white spot; throat and abdomen black; black bar crosses the breast, between which and the abdomen is a broad white band ..... 14. *Pt. decoratus.*

1. PTEROCLES PERSONATUS.

Pterocles personatus, Gould, Voy. 'Sulphur,' Zool. pl. 30 (1843); id. P. Z. S. (1843), p. 15; Gray, Gen. B. vol. iii. p. 519 (1845); Reich. Syn. Av. Gallinæ (1851), pl. ccviii. figs. 1821, 1822.

Hab. Madagascar.

This is one of the largest species of the genus, readily recognized from its relatives by the entirely black forehead and chin. M. Grandidier informs me that it is very abundant in Madagascar, where he has shot many, and that its flesh is palatable. In its economy and habits it does not differ from the other members of the genus.

Male. Forehead and chin jet black. Lower part of throat and sides of face buffy-white. Top of head, occiput, upper part of back and breast dark isabelline or vinous. Middle of back dark brown, greyish tinge on some feathers; rest of back, rump, and upper tail-coverts black, barred narrowly with light buff. Wings uniform, like the breast; a few of the greater coverts tipped with brownish black, forming three irregular bars upon the wing. Inner secondaries dark grey, tipped with vinous. Primaries dark chocolate-brown, with light edges on the inner webs. Abdomen, flanks, and vent barred narrowly with black and rufous; the feathers nearest the breast barred with black and buffy white. Under tail-coverts light chestnut. Tail brownish black, barred with white (these broadest and most numerous on the outer webs), the feathers largely tipped with white. Bill apparently bluish, with dark tips. Feet black.

Total length 13¾ inches; wing 9¾, tail 5, bill along gape ¾.

Female. Throat and sides of face buffy white; breast vinous. Entire upper parts and wings pale buff, barred irregularly with black. Primaries dark brown, with light edges and tips. Flanks and

chest barred with white and black; abdomen and vent barred with rufous and black. Under tail-coverts ochraceous. Tail blackish brown, barred and largely tipped with yellowish white. Bill and feet blue-black.

Total length 11¾ inches; wing 8½, tail 4¼, bill along gape ⅝.

A young bird differs from the female in having the breast vinous in the centre, pale buff on the sides, each feather with two narrow brown bars. Abdomen, flanks, and vent chestnut, barred sparingly with black. Wings very pale buff, barred with black. Rest of plumage as in the female.

2. PTEROCLES GUTTURALIS.

Pterocles gutturalis, Smith, Ill. S.-Afr. Zool. (Birds), pl. 3 ♂, pl. 31 ♀ (1849); Gray, Gen. B. vol. iii. p. 519 (1849); Reich. Syn. Av. Gallinæ (1851) pl. ccx. figs. 1829, 1830; von Heugl. Syst. Uber. Vög. N.O.-Afr. (1855) p. 304; Parker, Proc. Zool. Soc. (1862) p. 258; id. Journ. für Ornith. (1862) p. 286; Layard, Birds S. Afr. (1867) p. 278; id. Ibis (1868) p. 269; Ayres, Ibis (1869) p. 297; Blanf. Geol. & Zool. Abyss. (1870) p. 421; Von Heugl. Ornith. Nordost-Afr. Band ii. (1873) p. 862; Buckle, Ibis (1874) p. 385.

Hab. Kurrichaine, South Africa (*Smith*); Trans-Vaal (*Ayres, Buckley*); Adoa and Axum to Shoa, Abyssinia (*Heuglin*); Agula, Antalo, Abyssinia (*Blanford*).

This fine species of Sand-Grouse was first described by Sir A. Smith (*l. c.*), who obtained it about eighty miles to the eastward of Latakoo, his attention having been drawn to the bird by its cry, which was very different from that of *P. namaqua*, and resembled the syllables *tweet-tweet*. Like all the other species they resorted to the water in large flocks, but when feeding were dispersed and observed only singly or in pairs. Grass-seeds and abundance of gravel were found in the stomachs of the individuals that were killed. The eggs, which are two or three in number, are laid upon the bare ground; and the young take to a wandering life almost immediately after they are hatched.

In Abyssinia Mr. Blanford considers this species to be local, as he only saw it in two or three places in the highlands, at Agula and Antalo; and Rüppell mentions it only at Shoa, though Von Heuglin procured it near Adowa.

Mr. Ayres states that in the neighbourhood of Potchefstrom, in the territory of the Transvaal, this species is abundant towards the end of winter and beginning of spring. Their flight is strong, resembling that of Pigeons; and when alarmed, they do not run, but lie close to the ground, from which they take wing at once. Their notes, uttered only on the wing, are harsh, and may be heard at a considerable distance. They feed upon a species of tare or pea, and upon bulbous roots of a species of grass; from the aromatic properties of these last the birds, after feeding freely upon them, are thoroughly scented. Iris is dusky-brown. The egg is "1 1/16 in. by 1⅜ in.; the ground-colour is dusky-tawny, marked with lines and

blotches of umber, especially towards the base of the egg, where these marks form an encircling zone."

Male. Black stripe from nostrils to the eye; sides of head, neck, and throat pale buff; a black line encircles the lower part of the throat, and extends onto the back of the neck, where it is broadest. Top of head dark brown; back of neck pale greenish yellow. Breast dark greyish buff, with a wash of green. Entire rest of underparts chestnut. Back and inner secondaries greenish grey. Wing-coverts brownish grey, the greater ones tipped with ochraceous. Primaries dark brown, with pale edges. Median rectrices greenish grey; lateral ones black, tinged with ochraceous on edge of outer web, and tipped with light rufous. Under tail-coverts bright chestnut. Iris deep brown. Bill and feet black.

Total length 11¾ inches; wing 9, tail 4⅜, bill along gape ¾.

Female. Top of head black; feathers margined with light buff. Back of neck buff, with a central streak of black. Feathers of back, wings, and breast black, with a large buff spot on each web at the tip, those on lower part of back and wings being rather circular in form, giving those parts a spotted appearance, while the breast and upper part of back seem to be streaked with broad black lines on a buff ground. Secondaries black, scalloped on the edges, and tipped with light buff. Primaries blackish brown. Flanks, abdomen, thighs, and vent deep rufous, narrowly barred with black. Tail black, barred with deep buff along the margins of the webs, and tipped with reddish buff. Upper tail-coverts like the back; under coverts deep chestnut, barred on their basal half with black. Bill and feet black.

Total length 11 inches, wing 9, tail 4, bill along gape ¾.

3. PTEROCLES CORONATUS.

Pterocles coronatus, Licht. Verz. d. Doubl. (1823) p. 65; Temm. Planch. Color. (1825) nos. 339, 340; Rüpp. Neue Wirbelth. (1823–1835) p. 114; Wagl. Syst. Av. (1827) *Pterocles*, sp. 4; Gray, Gen. B. vol. iii. p. 519 (1849); Reich. Syn. Av. Gallinæ, pl. ccviii. figs. 1815, 1816 (1851); Heugl. Syst. Uber. N.O.-Afr. (1855) p. 304; Tristr. Ibis (1860) p. 71; Von Heugl. Journ. für Ornith. (1862) p. 415; Hartm. Journ. für Ornith. (1863) pp. 303, 307; Adams, Ibis (1864) p. 27; Allen, Ibis (1864) p. 240; Wyatt, Ibis (1870) pp. 9, 16; Shelley, Ibis (1871) p. 144; id. B. Egypt (1872) p. 221; Hume, Str. Feath. (1873) vol. i. p. 224; Von Heugl. Ornith. Nordost-Afr. (1873) Band ii. p. 863; Wise, Str. Feath. (1876) vol. iv. p. 230.

Hab. Rare in Egypt and Nubia (*Shelley*); southern parts of the Sahara (*Tristram*); El Kab, Egypt (*Allen*); Nubia and Kordofan (*Heuglin*); Nubia and Arabia (*Rüppell*); Plain of El Goa, Sinai (*Wyatt*); Jacobabad, N.W. Sindh (*Hume*); Kurrachee district (*Wise*).

According to Tristram this Sand-Grouse is confined to the more southern portions of the Sahara, where it supplants *P. arenarius*. He only met with it in parties of four or five; and the egg was of an

ashy white with a few almost obliterated pale-brown markings. In Egypt Capt. Shelley found this species to be rare, and also in Nubia; and he does not think it goes into the Delta. Dr. Adams met with it at the Second Cataract; and when at El Kab, Mr. Allen killed a pair out of a flock that came down to drink at a pool. Their cry was hoarser than that of the common species (*P. exustus*?),

Male. A line on each side of the forehead, from the nostril to above the eye, chin, and a narrow line down the centre of the throat jet black. A pearly grey band on each side of the occiput, meeting at the back of the neck. Centre of forehead white. Top of head vinous. Sides of neck, throat, and lower part of neck behind orange. Upper parts and wings vinous, with the tips of the wing-coverts pale buff, surrounded by a dark grey margin on the inner side. Primaries dark brown, with the tips of the 5th to 9th buffy-white; shafts of first two pure white, of the rest brownish white. Entire underparts pale sandy-buff, darkest on the middle of abdomen and vent. Median rectrices not extending beyond the rest, vinous. Lateral feathers pale rufous, with a subterminal bar of black, and white tips. Bill bluish. Feet dark brown.

Total length 10 inches; wing $7\frac{1}{4}$, tail $3\frac{1}{2}$, bill along gape $\frac{5}{8}$.

Female. Throat and sides of the neck orange, palest on the chin. Entire upper parts sandy buff with a vinous tinge, barred narrowly with black. Wings paler buff, irregularly barred with fine black lines, broadest and most conspicuous on the scapulars and some of the inner secondaries. Breast and underparts very pale buff, almost white upon the flanks, each feather margined with pale brown. Under tail-coverts yellowish white. Tail vinous, with a subterminal black bar, and white tip.

Total length 10 inches, wing $7\frac{3}{4}$, tail $3\frac{1}{2}$, bill along gape $\frac{5}{8}$.

4. PTEROCLES SENEGALUS.

Tetrao senegalus, Linn. Mantissa (1771) p. 526; Lath. Ind. Orn. vol. ii. p. 642.

La Gélinotte de Sénégal, Buff. Planch. Enlum. p. 130.

Pin-tailed Grous, var. A, Lath. Gen. Syn. (1783) p. 748.

Senegal Grous, Lath. Gen. Hist. B. vol. viii. (1823) p. 253.

Pterocles guttatus, Licht. Verz. d. Doubl. (1823) p. 64; Rüpp. Neue Wirbelth. (1823–1835) p. 114; Wagl. Syst. Av. (1827), *Pterocles*, sp. 8; Less. Trait. Ornith. (1831) p. 517. sp. 8; Allen, Ibis (1864) p. 240; Gould, B. Asia, pt. iii. pl. 6; Hume, Ibis (1872) p. 468; Von Heugl. Ornith. Nordost-Afr. Band ii. (1873) p. 860.

Pterocles senegalensis, Shaw, Nat. Misc. vol. iv. pl. 933; Taylor, Ibis (1859) p. 50, (1867) p. 67; Heugl. Syst. Uebers. Vög. Nordost-Afr. (1855) p. 304; Speke, Ibis (1860) p. 247; Tristr. Ibis (1868) p. 211; Taczanow. Journ. für Ornith. (1870) p. 51; Shelley, Ibis (1871) p. 144.

Pterocles senegalus, Gray, Gen. B. vol. iii. p. 519 (1845); Tristr. Ibis (1860) p. 71.

Pteroclurus senegalus, Bon. Compt. Rend. (1856) vol. xlii. p. 880; Reich. Syn. Av. Gallinæ (1851) pl. ccx. figs. 1831, 1832.

Pterocles senegalus, Shelley, B. Egypt (1872) p. 220; Hume, Str. Feath. (1873) vol. i. p. 221; James, Str. Feath. vol. iii. (1875) p. 418; Butler, Str. Feath. (1875) vol. iii. p. 4, (1877) vol. v. p. 231.

Fukee, Somali (Speke).

Hab. Egypt (*Shelley*); extreme south of the Sahara (*Tristram*); Somali country, East Africa (*Speke*); Egypt and Nubia (*Rüppell*); Palestine (*Tristram*); Sindh, Northern Guzerat, along the shores of the Runn of Cutch (*Hume*).

Canon Tristram states that this species is confined to the extreme south of the Sahara, but is more plentiful there than *P. coronatus*. He obtained one nest; and the egg had a ground-colour similar to that of *P. alchata*, but was scarcely more than half the size, and had very faint brown spots.

In the Somali country Capt. Speke met with this Sand-Grouse on the plateau in large flocks. In Sindh Mr. Hume found this species in certain localities to be very numerous. Their habits are very much like those of other Sand-Grouse, keeping together in parties of from fifty to sixty; and very often in winter a flock consists of one sex only. They trot about on the dry soil, picking up seeds and insects, or squat and enjoy the warmth of the morning sun. They seemed to be less pugnacious than some of the other species, as, although he watched them closely, he did not observe the perpetual skirmishing among the males, such as he had noticed took place with those of *P. arenarius* in the Punjaub. It is probable that this species breeds in Sindh.

Male. General plumage sandy buff. Lores and a band encircling the back of the head pearly grey. Underparts sandy-buff, washed with grey on the breast. Middle of abdomen black. Basal portion of scapulars, greater wing-coverts, and secondaries dark brown, tips buff. Primaries pale buff, graduating into brownish black towards the tips, which are buff. Central rectrices lengthened beyond the rest, pale buff, apical half black; lateral ones greyish brown, with a subterminal black band and white tips. Bill and feet lead-colour.

Total length 12½ inches, wing 7½, tail $\frac{5}{8}$, bill along gape $\frac{5}{8}$.

Female. Throat and sides of neck orange, lighter on the chin. Entire upper parts and wings sandy-buff, covered with black spots. Primaries sandy-buff, graduating into dark brown near the ends, and tipped with pale buff. Underparts bright buff, spotted on the breast with dark brown. Centre of abdomen black. Upper tail-coverts like the back. Median rectrices buff, faintly barred with black, their elongated tips brownish-black. Lateral feathers pale brown, lightest on the outer webs, with a subterminal brownish-black bar, and white tips. Bill dark horn-colour. Feet dark brown.

Total length 11½ inches, wing 8, tail 4¾, bill at gape ½.

5. Pterocles variegatus.

Pterocles variegatus, Burch. Trav. S. Afr. vol. ii. p. 345 (1822); Gray, Gen. B. vol. iii. p. 519 (1849); Reich. Syn. Av. Gallinæ

(1851) pl. ccx. figs. 1833, 1834; Strickl. & Sclat. Contr. Ornith. (1852) p. 157; Lay. B. S. Afr. (1867) p. 279; id. Ibis (1868) p. 269, (1869) p. 375; Ayres, Ibis (1871) p. 262; Anderss. B. Dam.-l. (1872) p. 242.

Pterocles maculosus, Smith, Ill. S.-Afr. Zool. vol. ii. p. 345 (1822); Gray, Gen. B. vol. iii. p. 519 (1845).

Hab. Between Latakoo and the Tropics, South Africa (*Smith*); banks of the Limpopo and Mariqua (*Ayres*); Damaraland (*Andersson*).

Male. Throat and sides of face pearly-grey. Top of head and occiput deep buff streaked with black. Upper parts and wings brownish-black, tipped with yellowish-ochre, and spotted with white; the tips of the greater coverts, however, are reddish-ochre. Primaries brownish black, with light edges. Breast and entire underparts bright rufous, each feather with a subterminal white bar. Tail brownish-black, barred with light buff, and tipped with yellowish ochre. Bill black, feet yellowish-brown.

Total length 9½ inches, wing 6¾, tail 3½, bill along gape ½.

Female. Top of head bright buff, streaked with dark brown. Sides of head and throat bright uniform buff. Feathers of the back and wings blackish-brown, tipped with light yellowish-brown, and with two or three white bars on the webs, which do not, however, reach the shaft, and give to the back the appearance of being spotted with white. Primaries blackish-brown, edged at the tip with white. Breast reddish-buff, indistinctly barred with white. Underparts dull white, barred with pale brown. Upper tail-coverts like the back. Tail brownish-black, barred and tipped with light buff. Under tail-coverts uniform light buff. Bill black; feet yellowish-brown.

Total length 9⅜ inches, wing 6¾, tail 3½, bill along gape ½.

6. Pterocles arenarius.

Tetrao arenaria, Pall. Nov. Comm. Petropol. vol. xix. p. 418, tab. 8 (1774); id. Itiner. vol. iii. App. p. 699, no. 271; id. Zoogr. Rosso-Asiat. vol. ii. p. 73, pl. (1831); Lath. Ind. Orn. vol. ii. p. 642 (1790); Bonnat. Ency. Méth. tom. i. p. 200 (1790).

Sand-Grous, Lath. Syn. vol. ii. pt. 2. p. 751 (1783); id. Gen. Hist. B. vol. viii. (1823), p. 254.

Tetrao fasciatus, Desfont. Mém. de l'Acad. des Sc. p. 502 (1787).

Aragonian Partridge, Lath. Syn. Suppl. p. 223 (1787).

Perdix aragonica, Lath. Ind. Orn. p. 645 (1790); id. Gen. Hist. B. vol. viii. (1823) p. 256 B.

Pterocles arenarius, Temm. Pig. et Gallin. vol. iii. (1815) pp. 240, 712; id. Planch. Col. nos. 52, 53; id. Man. Ornith. (1820) vol. ii. p. 476, vol. iv. p. 330; Wagl. Syst. Av. (1827) *Pterocles*; Less. Trait. Ornith. (1831) p. 516, sp. 1; Fras. Proc. Zool. Soc. (1839) p. 121; Gray, Gen. B. vol. iii. p. 518 (1849); Blyth, Cat. B. Mus. Asiat. Soc. (1849) p. 249; Reich. Syn. Av. Gallinæ (1851) pl. ccvii. figs. 1809–12; Adams, Proc. Zool. Soc. (1858) p. 501; Salv. Ibis (1859) p. 352; Tristr. Ibis (1860) p. 69, (1868) p. 211; Irby, Ibis (1861) p. 223; Jerd. B. Ind. vol. iii. p. 496;

Bree, B. Eur. vol. iii. p. 226, pl. (1862); Tristr. Proc. Zool. Soc. (1864) p. 449; Lilford, Ibis (1866) p. 379; Drake, Ibis (1867) p. 428; Smith, Ibis (1868) p. 450; Taczanow. Journ. für Ornith. (1870) p. 51; Saund. Ibis (1871) p. 223; Rey, Journ. für Ornith. (1872) p. 154; Godman, Ibis (1872) p. 219; Garrod, Proc. Zool. Soc. (1873) pp. 468, 639, (1874) p. 254; Hume, Str. Feath. vol. i. (1873) p. 219; Krüper, Journ. für Ornith. (1875) p. 282; James, Str. Feath. vol. iii. (1875) p. 418; Butler, Str. Feath. (1876) vol. iv. p. 4, (1877) vol. v. p. 231; Dresser, Ibis (1876) p. 322; Schalow, Journ. für Ornith. (1876) p. 186; Scully, Str. Feath. (1876) vol. iv. p. 179?; Danf. Ibis (1877) p. 273.

Tetrao subtridactyla, Hasselq. It. p. 250.

Tuturuk, *Boora-kurra*, in Afghanistan (Jerdon). *Bukt-titar*, *Bakht-tit*, *Buklit*, also *Ban-chur-Kurmoor*, at Peshawur (Jerdon). *El Koudhre*, Arabic (Tristram). *Corteza*, near Seville (Saunders). *Ortega Churra*, in Spain (Lilford). *Barrigra negra* in Portugal (Smith). *Beghitak*, Yarkand (Scully).

Hab. Desert regions of Asia, Southern Europe, and North Africa (*Blyth*); plains of Fuerteventura, Gran Canary (*Godman*); Harakta plains of the Eastern Atlas, Djendeli, Madracen (*Salvin*); Sahara desert everywhere, except in the extreme south (*Tristram*); Erzeroum (*Dickson* and *Ross*); Asia Minor (*Danford*); Palestine (*Tristram*); very common in Jodhpoor, not uncommon in Sindh, fairly plentiful in eastern portions of Cutch, all along the eastern shores of the Runn, and in the north-eastern portions of Kattiawar (*Hume*); Punjaub, N.W. Provinces, Bengal (*Adams*), Besharik, Yarkand, and Koshtak in Eastern Turkestan (*Scully*); Western Persia (*De Filippi*).

When in Yarkand Mr. Scully states (*l. c.*) that he heard of a bird called *Beghitak* by the natives, which lived in the desert ground, was yellowish brown in colour, and had feathered legs, and long pointed wings. Its blood was reputed a specific for consumption. Although he did not succeed in obtaining a specimen, yet once near Besharik he saw a pair at a distance, and the next day he saw three more, which appeared to be yellowish brown above, breast dove-colour, abdomen dark or black, and lower tail-coverts white. They were so wild and wary that he could not get a shot at them. Although he refers these birds to *P. arenarius*, it is more probable, as suggested by Mr. Hume, they were *Syrrhaptes paradoxus*.

Jerdon, in the 'Birds of India,' says that this Sand-Grouse is only found in the north-west provinces and Sindh, rarely extending so low as Allahabad, is tolerably abundant in the Punjaub, and stated to be very abundant on the edges of the great desert. He had also heard of its having been killed near Nusserabad and in Khandeish. It arrives at the end of September, and leaves in March, and is therefore only a winter visitor in India. It frequents sandy plains, flies in vast flocks, and, like others of the family, it regularly visits twice a day certain drinking-places, and is fond of basking in the sun and rolling in the sand. The flight of this species is very strong and swift; and sometimes it traverses great distances. It is a very shy bird, difficult of approach, and much esteemed as an article of food

In flocks it is stated that one or other sex greatly preponderates; sometimes seven females are obtained to one male, and *vice versâ*.

Canon Tristram states (*l. c.*) that this species is universally distributed throughout the Sahara, except in the extreme south, where it gives place to *P. senegalus*. It has so much of the Plover-character that he took the first covey that he saw for large Plovers. He did not find it so wary as *P. alchata*; but when approached closely it would suddenly rise to a great height and fly for a long distance. The species lays three eggs of a pale fawn-colour, with obsolete pale brown blotches; they are elliptical in shape, and are placed two in a line, and the third lengthwise outside, in a depression in the ground. He observed that when the hen was sitting one wing was spread out to cover the eggs; and she thus presented a grotesque lopsided appearance. The flesh, although extremely white, was very poor and dry, without any flavour. In support of this testimony Capt. Irby says, in his paper "On the Birds of Oudh and Kumaon," that this bird, obtained by him near Hurdue, was uneatable and tended to confirm what the natives say, "that they live upon sand."

Male. Top of head and occiput dark brownish grey, with a pearly tinge, becoming a lighter grey on loral space, around the eye, and ear-coverts. Upper part of throat and sides of neck chestnut, becoming deep orange towards the back of the neck. Lower part of throat in front black. Breast pearly grey, crossed on the lower part by a rather broad black band, succeeded by another of rich buff, which is widest on the sides near the wings. Rest of underparts jet-black. Feathers of the back and wing-coverts are rich buff, each feather with a subterminal greyish-black bar, and tipped with orange-yellow. Secondaries deep buff, the terminal third of outer web bright orange; some of the inner ones with a subterminal greyish-black bar like the coverts, and some with this colour only along the shaft. Greater wing-coverts orange-yellow on their apical third. Primaries greyish black. Upper tail-coverts like the back; under coverts black, tipped with white. Rectrices pale rufous, crossed with narrow black bars, and tips white. Thighs black; tarsi covered in front with buffy white feathers. Bill bluish. Feet brownish. Iris brown. Total length 11$\frac{3}{4}$ inches, wings 9$\frac{1}{4}$, tail 4$\frac{1}{4}$, bill along gape $\frac{5}{8}$.

Female. Top of head and occiput rufous, streaked with black. Upper part of throat and sides of head yellowish white, the feathers of the lores and ear-coverts with a fine central black streak; lower part of throat crossed by a blackish band. Breast rich buff, becoming buffy white near the abdomen, the feathers of the upper part, with a central streak and spot at the tip, black. A black band crosses the lower part, beneath which there are no spots. Rest of underparts black. Back and wings deep buff, crossed irregularly with narrow black lines; the greater coverts tipped with orange. Secondaries deep buff, barred narrowly with black, and all but the innermost ones with a broad band of deep orange on the outer webs at their tips. Primaries greyish black, edges whitish. Rectrices very

dark brown, crossed with narrow indistinct brownish-black lines, and tipped with buffy white. Under tail-coverts black, tipped with white. Thighs brownish black; tarsi covered in front with short buffy-white feathers. Bill brownish, with a black tip. Total length 11½ inches, wing 9, tail 3⅜, bill along gape ⅝.

A young bird from Erzeroum has the head, back, wings, and breast light buff, with a central line and one or more bars on each feather black, some crossing in a direct line, some in the shape of arrow-heads. Primaries greyish black, with buffy-white tips. Abdomen and flanks black. Middle rectrices light buff, crossed with numerous narrow curved black bars; the lateral ones greyish black along the shafts, buff on the outer margin, barred with black and tipped with white, this last increasing in extent as it goes towards the external feather. Under tail-coverts brownish black, and tipped with white.

7. PTEROCLES EXUSTUS.

Bahtah Grous, Lath. Gen. Hist. Birds, vol. viii. (1823) p. 258.

Pterocles senegalensis, Licht. (nec Shaw), Verz. Doubl. p. 64 (1823).

Pterocles exustus, Tem. Pl. Col. (1825) nos. 354, 360; Wagl. Syst. Av. (1827), *Pterocles*, sp. 9; Rüpp. Neue Wirbelth. (1823–35) p. 114; Less. Trait. Ornith. (1831) p. 517, sp. 9; Sykes, Proc. Zool. Soc. (1832) p. 154; Gray, Gen. B. vol. iii. p. 519 (1849); Blyth, Cat. B. Mus. Asiat. Soc. (1849) p. 249; Reich. Syn. Av. Gallinæ (1851) pl. ccix. figs. 1823–24; Jerd. Madr. Journ. vol. xii. p. 3; Hutt. Journ. Asiat. Soc. Beng. vol. xvi. p. 785; Burgess, Proc. Zool. Soc. (1855) p. 30; Von Heugl. Syst. Uebers. Vög. N.O.-Afr. (1855) p. 304; Hartl. Syst. Ornith. W.-Afr. (1857) p. 205; Adams, Proc. Zool. Soc. (1858) p. 502; Taylor, Ibis (1859) p. 50, (1867) p. 67; Irby, Ibis (1861) p. 235; Jerd. B. Ind. vol. iii. (1864) p. 502; Tristr. Proc. Zool. Soc. (1864) p. 449; Gould, B. Asia, pt. ii. pl. 13; Adams, Ibis (1864) p. 27; Allen, Ibis (1864) p. 240; Tristr. Ibis (1868) p. 211; Beavan, Ibis (1868) p. 378; Blanf. Geol. & Zool. Abyss. (1870) p. 410; Shelley, Ibis (1871) p. 153; id. B. Egypt (1872) p. 218; Lloyd, Ibis (1873) p. 415; Hume, Str. Feath. (1873) vol. i. p. 225; Adams, Str. Feath. (1873) vol. i. p. 392; Von Heugl. Ornith. Nordost-Afr. Band ii. p. 855 (1873); id. Journ. für Ornith. (1875) p. 57; Butl. Str. Feath. (1875) vol. iii. p. 4; Fairb. Str. Feath. (1876) vol. iv. p. 262.

Pteroclurus exustus, Ball, Str. Feath. (1874) vol. ii. p. 426.

Bar-titar, Bakt-titar, Kumar-tit, Hind.; *Kuhar*, N.W. Prov.; *Jam polanka*, Tel.; *Kal-Kondari*, Tam. (Jerdon). *Gutta* in Egypt (Adams).

Hab. N.E. Africa and Arabia (*Heuglin*); Egypt and Nubia (*Shelley*); Upper Egypt (*Adams*); Hindustan, Middle and Western Asia, Southern Europe, North Africa (*Blyth*); Abyssinia (*Blanford*); Senegal, Mus. Berl. (*Hartlaub*); Casamanze (*Verreaux*); Nubia and Abyssinia (*Rüppell*); Palestine (*Tristram*); India, gene-

rally in desert places, unknown in Malabar, in wooded districts of Central India, in Lower Bengal, and in Assam, Sylhet, and Burmah (*Jerdon*); Dukhun (*Sykes*); Punjaub (*Adams*); Ahmednagar district, Khandala (*Fairbanks*); Chotah Nagpur (*Ball*); Oudh (*Irby*); common in Sindh (*Hume*); Sambhur lake (*Adams*); Umballah and Morar (*Beavan*); Kattiawar (*Lloyd*).

This species, Capt. Shelley states (*l. c.*), is the most abundant of the various kinds of Sand-Grouse met with in Egypt, and ranges throughout that country, as well as Nubia. It goes in small flocks, uttering, when on the wing, a peculiar loud note which is heard for a considerable distance in the morning and evening, when on their way to their drinking-places. The localities in which he found them most abundant were Fayoom, Golosaneh, Karnak, and between Silsilis and Kom Ombo. Its nest is simply a hole in the sand, lined with dried grass; and it breeds in April.

According to Jerdon this is the most common Sand-Grouse found in India, and is met with in every part of the country, except in the wooded districts. It frequents the open plains and ploughed lands or fallow fields. This species feeds early in the morning, and between eight and nine o'clock goes to drink, and again visits the water at about four o'clock in the afternoon. At such times thousands congregate at these places; and they come from all quarters, flying at a great height, and announcing their presence by a peculiar loud piercing call. They stay but a moment at the water-side, and then fly off. They are difficult to approach, and when on the ground can hardly be distinguished from it, the colour of their plumage assimilating so closely. This Sand-Grouse feeds on various hard seeds, especially of the *Alysicarpi*, *Desmodium*, &c., as well as on grass-seeds and grain. It breeds in the Deccan and Southern India from December to May, and still later in Central India. The eggs are laid on the bare ground, and are of a greenish colour, thickly spotted with grey and brown, and nearly of the same thickness at both ends. If kept some time after being killed, this bird is very good as an article of food. In Oudh, says Capt. Irby, this species is very common on the sandy plains from January to July. Two eggs, which he found in June, resembled in size and markings those of *Caprimulgus europæus*; and if there had been any trees near the place, he would have referred them to some species of Goat-sucker. Dr. Adams says that this bird, when wounded, spreads out its tail and wings, hiding its head under the breast, and emits a series of chuckles, like a fowl. As with the same species in India, he found the flesh very dry, and the only possible way of making them fit for the table was to remove the skin before cooking them.

Male. Head, neck, entire upper parts, and breast sandy buff, lightest on the breast, and having a greenish shade on the back. Throat orange. Across the breast at the shoulders is a narrow black band, occasionally edged on its upperside with white. Rest of underparts bright chesnut, with the centre of the abdomen black. Wings like the back, each feather margined at the tip with a narrow line of blackish chestnut, and the outer webs of secondaries and

greater coverts yellow on the terminal third. Some of the feathers also have a small white spot just beneath the dark line on the tip. Primaries brownish black; the inner ones tipped with white, broadest on the inner web. Central rectrices much lengthened beyond the rest, deep buff, indistinctly mottled with dark brown near the base, with an irregular scalloped subterminal black bar, then buffy white, and the lengthened narrow apical portion black. Lateral ones with the inner webs dark rufous brown; outer ones buff, barred with blackish brown, a subterminal black bar, and white tips. Under tail-coverts brownish black, with white tips. Thighs chestnut, tarsi covered in front with short buffy-white feathers.

Total length 9¾ inches, wings 7, tail 3½, bill along gape ⅝.

Female. Top of head buff, darkest in the centre, each feather with a central line of black. Throat and loral space pale orange-yellow. Sides and back of neck and breast bright buff, each feather with a wedge-shaped central black line, the widest part being at the tip, and also with another black bar crossing it in the centre. The feathers on the lower part of the breast are tipped with black, margined on the upperside with white, forming an irregular band across, below which there is an unspotted light buff space. Flanks, abdomen, thighs, and vent black, narrowly barred with rufous. Upper parts bright buff, barred narrowly with jet-black. Wing-coverts like the back, the lesser ones tipped with blackish chestnut, the greater ones broadly tipped with light yellow, forming a broad band on lower side of the wing when closed. Secondaries light buff, barred with black, the tips of outer webs of some of the outer secondaries light yellow. Primaries chocolate-brown, broadly tipped on inner webs with white. Upper tail-coverts like the back. Median pair of rectrices extended beyond the rest, attenuated for their terminal third, which is brownish black, the remaining portion being bright buff, barred narrowly with black; lateral feathers dark brown on inner webs, bright buff on outer, with numerous bars of black, and tips white. Under tail-coverts yellowish white, barred with black. Bill brownish black.

Total length 11¾ inches, wing 7, tail to end of central rectrices 4⅝, bill along gape ⅝.

8. PTEROCLES ALCHATA.

The Little Pin-tailed Grouse, Edw. Glean. p. 84, pl. 249 (1758).

Tetrao alchata, Linn. Syst. Nat. (1776) vol. i. p. 276; Gmel. Syst. Nat. (1788) vol. i. p. 754; Lath. Ind. Orn. vol. ii. p. 641 (1790); Bonnat. Ency. Méth. (1790) tom. ii. p. 203, pl. 92. fig. 3.

Pin-tailed Grous, Lath. Gen. Syn. (1783) vol. ii. pt. 2nd, p. 748.

Pterocles setarius, Temm. Pig. et Gallin. vol. iii. pp. 256, 714 (1815); id. Mon. Ornith. vol. ii. p. 478 (1820), vol. iv. p. 330; Wagl. Syst. Av. (1829) *Pterocles*, sp. 6; Less. Trait. Ornith. (1831) p. 516. sp. 6; Parker, Proc. Zool. Soc. (1864) p. 258; Taczanow. Jour. für Ornith. (1870) p. 51.

Œnas cata, Vieill. Nouv. Dict. Hist. Nat. vol. xii. p. 418 (1817).

Pin-tailed Grous, Lath. Gen. Hist. B. vol. viii. (1823) p. 250.

Pterocles alchata, Licht. Verz. Doubl. p. 64 (1823); Tristr. Proc. Zool. Soc. (1864) p. 449; Jerd. B. Ind. vol. iii. p. 500 (1864); Gould, B. Eur. pl. 258; Blyth, Cat. B. Mus. Asiat. Soc. (1849) p. 249; Gray, Gen. B. vol. iii. p. 518; Reich. Syn. Av. (1851) Gallinæ, pl. ccvii. figs. 1813–14; Heugl. Syst. Uebers. Vög. Nordost-Afr. (1855) p. 303; Salv. Ibis (1859) p. 352; Tristr. Ibis (1860) p. 70; Powys, Ibis (1860) p. 239; Wright, Ibis (1864) p. 139; Lilford, Ibis (1866) p. 379; Bartl. Proc. Zool. Soc. (1866) p. 78; Drake Ibis (1867) p. 428; Beaven, Ibis (1868) p. 377; Smith, Ibis (1868) p. 451; Hume, Str. Feath. (1873) vol. i. p. 221; Garrod, Proc. Zool. Soc. (1873) p. 468; Severzov, Journ. für Ornith. (1873) pp. 385, 386; Von Heugl. Ornith. Nordost-Afr. (1873) vol. ii. p. 853.

Tetrao chata, Pall. Zoogr. Rosso-Asiat. vol. ii. p. 73 (1831).

Pterocles caspius, Ménétr. Cat. Rais. de Zool. p. 47 (1832).

Pteroclurus alchata, Bon. Compt. Rend. vol. xlii. p. 880 (1856).

El-Guettha Arab (Tristram). *Ganga* in Spain (Lilford). *El Koudre* in Tangiers (Drake). *Corticol* in Portugal (Smith).

Hab. Middle Asia, Afghanistan, Syria, Spain, N. Africa (*Blyth*); Portugal (*Smith*); common in Spain (*Lelford*); Tangier (*Drake*); Harakta Plains of Eastern Atlas (*Salvin*); Malta (*Wright*); Palestine (*Tristram*); Punjaub and Sindh (*Jerdon*); Jacobadad, Sindh, Nundan, near Altock, Peshawur valley, Abbotabad, and isolated localities in Huzara (*Hume*); Western Persia (*De Filippi*).

Jerdon says that this is a rare bird in India, only a few finding their way across the Sutlej. It flies in flocks, and is shy and wary. The specific appellation is taken from its Arabic name *El-chata* or *El-katta*; and in India there does not seem to be any special native name for the bird.

Tristram found this Sand-Grouse in vast flocks in winter in the Mzab and Tonarick country; and, except in the breeding-season, it was very difficult to approach, and when packed it is necessary to be well-mounted to get a second shot. It is even more vigorous upon the wing than *P. arenarius*, and when on the ground is very garrulous. Its breeding-habits are exactly the same as those of the species just named; but the egg has a much richer fawn-coloured tint, and is covered and sometimes zoned with large maroon-red blotches.

In Spain, as stated by Lord Lilford (*l. c.*), this species, as well as *P. arenarius*, is common in many parts of the Castilles, La Mancha, Murcia, Andalusia, Estremadura, and in some districts of Aragon and Catalonia. They delight in bare and stony ground; and even in "hungry Spain" they are considered "muy male carne."

Male. Top of head and nape dark greyish brown; superciliary stripe and sides of the throat deep orange; ear-coverts yellowish; a black line goes from behind the eye and down the sides of the nape. Throat black; upper part of breast greenish buff; rest of breast chestnut, bounded above and below with a narrow black line; remainder of underparts white. The back has the feathers vinous at base, rest pale yellowish green, with a yellowish spot at tip.

Rump and upper tail-coverts buff, barred narrowly with black. Lesser wing-coverts pale vinous at base, then a narrow line of white followed by a broader one of pale chestnut, and then a narrow line of yellow, and tipped with pale chestnut. Some of the outer larger wing-coverts were like those just described; but the inner ones are dark, have the base dark ash, then rich yellow, and narrowly bordered with black. Inner secondaries rufous at base, barred with black, tipped with pale green, and a conspicuous yellow spot in the centre. Rest of secondaries pale yellowish-green, with yellow on their outer webs near the tips. Primaries ashy grey, margined on inner webs with white; the secondaries and tertiaries inclined to buff along the shaft on inner webs; shafts black. Tail-feathers buff, barred with black and tipped with white; the two central ones entirely black on their apical half, are extremely narrow, and extend far beyond the other rectrices. Under tail-coverts buff, barred with black, and tipped with white. Feathers of the tarsi white. Bill horn-brown. Bare space around the eye lead-colour; iris dark brown.

Total length 13$\frac{1}{4}$ inches, wing 8, tail to end of longest rectrices 6, bill along gape $\frac{11}{16}$.

Female. Top of head and back of neck deep buff, barred with black. Sides of face and neck orange-yellow. Chin and throat white. A black band around the lower part of neck, but not extending onto the back of the neck, beneath which is a broad light chestnut band bordered above and below with black as in the male. Entire underparts pure white. Upper parts buff, narrowly barred with black. Wing-coverts buff, barred with black, and with a grey spot on inner web near tip, this spot on some of the greater coverts being enlarged into a bar crossing the feathers near the tip. Secondaries buff, barred with black, and having a sub-terminal grey bar. Primaries like those of the males. Upper tail-coverts yellowish buff, irregularly barred with black. Rectrices like those of the male. Bill horn-colour.

Total length 13 inches, wing 7$\frac{3}{4}$, tail 5$\frac{3}{8}$, bill at gape $\frac{5}{8}$.

9. PTEROCLES NAMAQUA.

Namaqua Grous, Lath. Gen. Syn. B. (1783), vol. ii. pt. 2, p. 750; id. Suppl. p. 215; id. Gen. Hist. B. vol. viii. (1823) p. 251.

Tetrao namaqua, Gmel. Syst. Nat. (1788) vol. i. p. 754; Lath. Ind. Orn. vol. ii. p. 642, sp. 19; Sparrm. Voy. vol. i. p. 153; Bonnat. Enc. Méth. (1790) tom. ii. p. 204.

Pterocles tachypetes, Temm. Pig. et Gall. (1815) pp. 274, 715; Wagl. Syst. Av. (1827), *Pterocles,* sp. 7; Less. Trait. Ornith. (1831) p. 517, sp. 7; Layard, B. S. Afr. (1867) p. 277; Ayres, Ibis (1871) p. 262.

Œnas namaqua, Vieill. Nouv. Dict. Hist. Nat. (1817) vol. xii. p. 422.

Pterocles simplex, Less. Trait. Ornith. (1831) p. 517.

Pterocles namaqua, Gray, Gen. B. vol. iii. p. 518; Bocage, Journ. für Ornith. (1876) p. 303.

Pteroclurus namaqua, Reich. Syn. Av. *Gallinæ* (1851) pl. ccix.; Anderss. Dam.-l. (1872) p. 242.

Hab. Palestine (*Tristram*); Transvaal, between Potchefstroom and Marico (*Ayres*); Damara-land (*Andersson*).

Mr. Ayres first met with this species in the Transvaal between Potchefstroom and Marico, and afterwards along the river Limpopo, but nowhere very abundant. They squat on the approach of danger, and rise suddenly, with a quick beat of the wings; and their flight is very rapid. The iris is dusky, and eyelids yellow.

According to Layard, the Namaqua Grouse is very abundant on the Karroo plains throughout the Cape colony and in Namaqua-land. It congregates in small parties, runs with considerable swiftness, and the flight is very rapid. Its note, when on the wing, resembles the piping of a Plover, to which bird this species bears a considerable resemblance. It sometimes, during droughts, extends its migrations to the Cape Flats. It lays from seven to ten eggs, light cream-colour, spotted with brown and purple, axis 17‴, diameter 12‴. Andersson states that this bird is common in some parts of Damara-land, and generally comes to the water about eight or nine o'clock in the morning. They circle around at a considerable height, and frequently do not attempt to descend until directly over the spot, when they shoot down with great velocity, describing more or less of semicircles before they alight. They feed on seeds, berries, and small bulbs, and swallow gravel to assist the digestion.

Male. Top of head dark brown. Throat orange. Upper part of breast vinous, crossed on the lower part by a band of white, followed by another of reddsh chestnut. Flanks dark vinous grey. Middle of abdomen chestnut; vent and under tail-coverts yellowish white. Upper parts dark brown, lighter on the rump and upper tail-coverts, and washed with green. Scapulars dark brown, with a subterminal light buff bar and purplish-grey tips. Wing-coverts ashy brown, subterminal buffy white bar, and chestnut tips. Secondaries dark vinous brown, inclining to light buff near their tips. Primaries rufous brown; shafts rufous, except those of first and second, which are white, and the sixth to tenth broadly margined with white on their inner webs towards their tips. Median rectrices extending slightly beyond the rest, rufous brown, graduating into dark brown on their attenuated portion; rest of tail rufous brown, and tipped with yellowish white. Bill horn-colour. Feathers on tarsus buffy white.

Total length 10½ inches, wing 7, tail 4½, bill along gape ½.

Young male. Differs in having the entire underparts very deep vinous buff, inclining to rufous on the abdomen, and ochraceous on the vent and under tail-coverts. Feathers of the back and wings barred with rufous and black irregularly, and tipped with greyish purple on the scapulars and some of the inner secondaries. Tail buff, barred narrowly with dark brown. Head, throat, and back of neck as in the adult males.

Female. Top of head, back, and sides of neck and breast deep

buff; feathers of the first with a central streak of black; those of the other parts barred irregularly with the same colour. Rest of underparts buffy white, graduating into light buff upon the flanks and lower tail-coverts, and all, except the last-named, barred narrowly with black. Upper parts buff, barred irregularly with narrow lines of black, and some of the scapulars tipped with greyish purple as in the male. Primaries same as the male. Median pair of rectrices slightly elongated beyond the rest, reddish-buff, barred narrowly with black, and with black tips; the lateral feathers blackish brown, with irregular reddish-buff bars on the outer webs, and with yellowish-white tips. On the inner webs the buff bars are very faintly indicated, and on some of the feathers they are obsolete. Bill horn-brown.

Total length 9$\frac{7}{8}$ inches, wing 6$\frac{5}{8}$, tail 4$\frac{1}{4}$, bill along gape $\frac{1}{2}$.

10. PTEROCLES FASCIATUS.

Tringa fasciata, Scop. Delic. Faun. et Flor. Insubr. vol. ii. p. 92 (1786).

Indian Grous, Lath. Gen. Syn. (1783) p. 752; id. Gen. Hist. B. vol. viii. (1823) p. 260.

Tetrao indicus, Gmel. Syst. Nat. (1788) vol. i. p. 755; Bonnat. Ency. Méth. (1790) tom. i. p. 201.

Perdix indica, Lath. Ind. Orn. vol. ii. p. 650, sp. 23 (1790).

Œnas indicus, Vieill. Nouv. Dict. Hist. Nat. (1817) p. 422.

Pterocles quadricinctus (nec Temm.), Less. Trait. Ornith. (1831), p. 526, sp. 3; Sykes, Proc. Zool. Soc. (1832) p. 155; Burgess, Proc. Zool. Soc. (1855) p. 30.

Pterocles fasciatus, Gray, Gen. B. vol. iii. p. 518; Blyth, Cat. Birds Mus. Asiat. Soc. (1849) p. 249; Jerd. Ind. Ornith. pls. 10, 36; Reich. Syn. Av. Gallin. (1851) pl. ccviii. figs. 1815–16; Adams, Proc. Zool. Soc. (1868) p. 502; Jerd. B. Ind. vol. iii. p. 498 (1864); Gould, B. Asia, pt. ii. pl. 14; Beavan, Ibis (1868) p. 378; Lloyd, Ibis (1873) p. 415; Adams, Str. Feath. (1873) vol. i. p. 391; Ball, Str. Feath. (1873) vol. ii. p. 426; Fairb. Str. Feath. (1876) vol. iv. p. 262; Wise, Str. Feath. (1876) vol. iv. p. 230; Butler, Str. Feath. (1877) vol. v. p. 231.

Handeri in the south; *Boot-bur* in the north-west; *Sunda polanka* Tel. (Jerdon).

Hab. India generally, except Malabar and Lower Bengal (*Jerdon*); Dukhan (*Sykes*); Punjab (*Adams*); Deccan (*Burgess*); Khandesh (*Wise*); Morar, near Gwalior, Umballah (*Beavan*); Kattiawar (*Lloyd*); Hindustan generally (*Blyth*); Sambhur lake (*Adams*); Chota Nagpur (*Ball*); Ahmednagar district, Kandalia (*Fairbank*).

Jerdon (*l. c.*) states that this species is found over the greater part of India, but not in Malabar and Lower Bengal, and is not abundant anywhere. He had seen it in the Carnatic, the Deccan, and in Central India; and Adams records it as pretty common in the jungles around the base of the Sewalik range in the Punjaub. Unlike other Sand-Grouse, it frequents thickets, and chiefly bushy and

rocky hills. It is generally met with in pairs, towards the end of the rains in parties of eight or ten, and when flushed rises with a low chuckling call, and after a short low flight drops again into cover. The eggs, cylindrical in form, are a dull earthy green, with a few dusky spots. It was procured in Kattiawar, Western India, by Capt. Lloyd, in the Than district, where one evening a small party, coming to drink after dusk, alighted in front of his tent. He thought they were Goatsuckers; and on firing at them was surprised to find he had secured a specimen of this Sand-Grouse. In the vicinity of Sambhur lake, Central India, Mr. Adams found this species common about all the low ranges of hills. The nest was simply a hollow scraped in the ground, with a number of small pieces of stone round the edge, and some loose grass for a lining. The number of eggs varied from two to three; in one instance, however, four were found. He gives their colour as very different from that mentioned by Jerdon, viz. a deep to pale salmon-colour when fresh; but, on being blown, in a few days this tint changes to a rich cream-colour, and the spots are light lavender and rusty. They are of a blunt oval form, 1·4 inch in length by 1 inch in breadth.

Male. A conspicuous black band crosses the forehead, below which, covering the nostrils and also over each eye, is a pure white spot. Top of head and occiput buff, streaked with narrow black lines. Sides of head, throat, neck, and upper part of breast uniform sandy buff. Upper part of back similarly coloured, but darker. Across the breast, extending from the shoulders of the wing, are, first, a band of deep chestnut, widest in the centre, succeeded by a broader one of light buff, beneath which is an irregular one of black. Rest of underparts black, narrowly banded with white or buffy white. Feathers of back and rump generally crossed by three black bars, and tipped with sandy buff; and between the first and second black bar from the tip is one of white. Shoulders uniform sandy buff. Wing-coverts and outer secondaries crossed by several black and white bars, forming two or three conspicuous bands across the wing, the tips of all the feathers being fulvous. The inner secondaries are buff, barred only with black, no white. Primaries brownish black, edged on both webs with whitish. Tail and under tail-coverts fulvous, barred with black. Bill red, orbital skin lemon-yellow; irides dark brown. Feet yellowish. Total length 9½ inches, wing 7, tail 3¼, bill at gape ⅝.

Female. Throat and cheeks pale buff. Head reddish buff, streaked with black. Entire upper and under surface sandy buff, barred irregularly with brown. Tips of wing-coverts pale buff. Primaries and secondaries dark brown, edged on inner webs with white. Bill red. Dimensions about the same as the male.

11. PTEROCLES BICINCTUS.

La Gélinotte des Indes, Sonner. Voy. aux Indes Orient. et à la Chine, vol. ii. pl. 96 (1782).

Pterocles bicinctus, Temm. Pig. et Gall. tom. iii. pp. 247, 713; Gray, Gen. B. vol. iii. p. 518.

Œnas bicincta, Vieill. Nouv. Dict. Hist. Nat. vol. xii. (1817) p. 421; id. Gal. Ois. vol. ii. (1834) p. 60 (text).

Double-banded Grouse, Lath. Gen. Hist. B. vol. viii. (1823) p. 259.

Pterocles bicinctus, Wagl. Syst. Av. (1827) *Pterocles*, sp. 2; Less. Trait. Ornith. (1831) p. 516, sp. 2; Reich. Syn. Av. Gallinæ (1851) pl. ccviii. figs. 1819-20; Strickl. and Sclat. Contr. Ornith. (1852) p. 157; Layard, Birds S. Afr. (1867) p. 278; Ayres, Ibis (1869) p. 298; Gurn. Anderss. Birds Dam. L. (1872) p. 241; Buckley, Ibis (1874) p. 385; Bocage, Journ. für Ornith. (1876) p. 303.

Hab. Transvaal, near the Limpopo (*Ayres*); Limpopo, to the Matabili country (*Buckley*); Damara and Great Namaqua Lands (*Andersson*).

This is the most common of the Sand-Grouse found near the Limpopo, according to Mr. Ayres, with perhaps the exception of *P. gutturalis*. The greater number in June were in flocks, although some few had paired and were breeding. The eggs are laid on the bare ground, and are brownish pink, spotted and blotched all over, particularly at the thick end, with a lighter tint of the same colour. Size $1\frac{6}{16}$ by $\frac{15}{16}$ inch. This species was also found to be very abundant from the Limpopo to the Matabili country by Mr. Buckley; and in the evening they come down in immense flocks to the water-holes to drink. During the day he met with them chiefly in pairs, or three individuals together; and when they rose from the ground they uttered a creaking note. According to Andersson, this species is very abundant in Damara and Great Namaqua Lands, and can always be met with during the dry season at any of the permanent watering-places to which they resort at morning and evening. When dispersed they usually go in pairs, and feed chiefly on the seeds of grasses and berries, mingling with their food considerable quantities of coarse sand.

Their flesh, though very white, is excessively tough, and it is best to skin the bird before cooking. The iris is deep red, the skin round the eye chrome-yellow.

The figure given by Sonnerat in his 'Voyage aux Indes Orientales et à la Chine' is evidently referable to this species; from having only two bands upon the breast, a white one succeeded by a black one, it cannot possibly represent *P. fasciatus*, Scop., to which it has been referred by some authors. In his text Sonnerat only mentions one band, the *white* one, which does not describe any species of Sand Grouse at present known. The locality, "côte de Coromandel," however, is not one of the habitats of the present species, so far as I am aware, as it is apparently solely found in Africa.

The specimens described by Temminck were given to him by Le Vaillant, who procured them in Namaqualand.

Male. Black bar across the forehead, in front of which and over each eye is a white spot, these latter sometimes coalescing and forming a white bar behind the black one. Top of head and occiput rufous, streaked with black. Throat, sides of neck, upper part of

back, breast, and shoulders of the wing uniform sandy buff, with a greenish tinge. Lower part of breast crossed by two rather broad bands, the upper one pure white, the lower jet-black. Rest of underparts barred narrowly with buffy white and brownish black. Feathers of the back rufous, barred with greyish black, those on the rump tipped with yellowish white. Greater wing-coverts and secondaries brownish grey, with a white spot at the tip of each feather. Primaries rufous-brown, all but the first two tipped with white. Tail, with the upper and under coverts, light buff, barred with brownish black. Bill reddish; feet yellow.

Total length 9¾ inches, wing 6⅝, tail 3½, bill (along gape) ⅝.

Another, younger male specimen differs in having a narrow black line over each eye, between it and the white mark, and also by having the back and inner secondaries deep rufous, irregularly barred with black, the wing-feathers tipped with buffy white. Outer secondaries blackish brown, like the primaries, some tipped on outer web with light buff, others with a subterminal bar of the same colour. The greater wing-coverts are blackish brown tipped with yellowish white.

Female. Head, back, neck, and breast buff, irregularly barred with brownish black, and tipped with buffy white on the back and breast. No band across the breast. Flanks, abdomen, and vent barred with white and black. Wings irregularly barred with black and reddish buff, the feathers tipped with white; primaries chocolate-brown. Tail and its coverts reddish buff, barred with black and tipped with fulvous. Bill reddish, tip black; feet yellowish.

Total length 9¾ inches, wing 7, tail 3½, bill along gape ⅝.

12. PTEROCLES QUADRICINCTUS.

Pterocles quadricinctus, Temm. Pig. et Gallin. (1815) vol. iii. pp. 252, 713; Wagl. Syst. Av. (1827), *Pterocles*, sp. 3; Strickl. Proc. Zool. Soc. (1850) p. 220; id. Ann. & Mag. Nat. Hist. 2nd ser. vol. ix. p. 347; Heugl. Syst. Uebers. Vög. N.O.-Afr. (1855) p. 304; Hartl. Syst. Ornith. W.-Afr. (1857) p. 205.

Œnas bicinctus, Vieill. (nec Temm.) Gal. Ois. pl. 220, nec text (1834).

Pterocles tricinctus, Swains. Birds W. Afr. (1862) vol. ii. pl. 23; Von Heugl. Ornith. Nordost-Afr. (1873) Band ii. p. 867.

Hab. Sennaar, Abyssinia (*Heuglin*); West Africa (*Strickland*).

Some confusion has been created in the synonymy of this species by Vieillot having figured it in his 'Galerie des Oiseaux' as *bicinctus* (a name given by Temminck to quite a different species), while in the text he has correctly described the true *bicinctus* and not the bird represented in his plate. Although Vieillot's figure only shows *three* bands across the breast, yet Temminck asserts, in the 'Planches Coloriées' (genre *Ganga*, footnote), that it is his *quadricinctus*; and as it is natural to suppose he knew his own species when he saw it, I have taken his determination as the correct one, more especially as I have never been able to find a specimen of *Pterocles* with *four* well-defined bands across the breast. So far as I can judge from the

specimens I have seen, the name *tricinctus*, given to this species by Swainson, is by far the most appropriate one; and it is to be regretted that it cannot be employed.

Temminck also refers to the present species the bird figured and described by Sonnerat, who, he states, was the first to make it known as La Gélinotte des Indes. In this determination I believe Temminck to have been mistaken, and that he confounded Sonnerat's bird with the *Pt. bicinctus* of Temminck. The species figured by Sonnerat has but two bands on the breast, a black and a white one; and I consider it to be the *Pt. bicinctus*, Temm., and have accordingly referred it to that bird.

The only habitats I can find for *Pt. quadricinctus* are Abyssinia and Sennaar on the east coast, while Swainson gives West Africa as the place whence his specimen came. It has never, so far as I am aware, been found in India. The examples described by Temminck were in the cabinet of M. de Breukelewaert at Amsterdam.

Male. Spot on the forehead, covering the nostrils, and one over each eye white. A broad black band crosses the forehead just in front of the eyes. Top of head and occiput fulvous, streaked narrowly with black. Throat yellowish white. Nape, sides of neck, and breast uniform sandy buff. Across the lower part of the breast are three bands, the first dark chestnut, the second white, and the third black. Temminck says there is a fourth one, of white. I do not perceive this in the specimens before me; but I am inclined to think individuals vary in the number of these bars. Underparts black, narrowly barred with white. Back deep buff, barred with jet-black. Wings fulvous, the shoulders uniform, not spotted. Wing-coverts and secondaries crossed by a *single black bar, margined on both sides with white*. The innermost secondaries have numerous black bars, and *no white ones*. Tail and under-coverts deep buff, barred with black. Bill red; feet yellow.

Total length 9½ inches, wing 7⅕, tail 3¾, bill (along gape) ⅝.

Specimen described from the White Nile.

Female. The entire top of head fulvous, streaked with black, and the back of neck spotted with the same. Throat white. Breast bright fulvous, without any bars, and the underparts barred with white and narrow lines of brownish black. Feathers of back and inner secondaries rufous, barred with black and margined with fulvous. Wings and outer webs of outer secondaries pale buff, crossed by several narrow jet-black bars. Inner webs of outer secondaries and primaries brownish black. Tail and its under-coverts deep buff, barred with black. Bill reddish horn-colour; feet yellow.

Total length 9¼ inches, wing 7¼, tail 3¼, bill (along gape) ⅝.

13. Pterocles lichtensteini.

Pterocles lichtensteini, Temm. Planch. Col. (1825) no. 355, 361 Rüpp. Neue Wirbelth. (1823–38) p. 114; Wagl. Syst. Av. (1827), *Pterocles*, sp. 8; Less. Trait. Ornith. (1831) p. 516. sp. 8; Gray, Gen. B. vol. iii. p. 518 (1849) partim; Reich. Syn. Av. Gallin. (1851) pl. ccix. figs. 1827–28; Heugl. Syst. Ubers. Vög. Nord-

ost-Afr. (1855) p. 304; id. Ibis (1859) p. 343; Speke, Ibis (1860) p. 247; Blanf. Geol. & Zool. Abyss. (1870) p. 419; Hume, Ibis (1872) p. 468; Finsch & Hartl. Vög. Ost-Afr. p. 563; Hume, Str. Feath. (1873) p. 219; Von Heugl. Ornith. Nordost-Afr. (1873) Band ii. p. 865; Wise, Str. Feath. (1876) vol. iv. p. 230.

Pterocles bicinctus, Licht. (nec Temm.) Verz. Doubl. (1823) p. 65.

Hab. Very common in the Danakil and Somali countries (*Heuglin, Speke*); Abyssinia (*Blanford*); Egypt and Nubia (*Rüppell*); Gool Mahomed Mehur, Upper Sindh (*Hume*); Kurrachee district (*Wise*).

Blanford (*l. c.*) states that the habits of this bird in Abyssinia are the same as those of the *Pt. fasciatus* of India. It is but rarely met with in the open plains, but keeps to bush- or tree-jungle, and in such places is usually found in pairs. The drinking-hours are at daybreak and at dusk; and the scene at a spring in the evening, he says, is very interesting, the birds coming in with a constant rush until dark. Single birds and small flocks, uttering a note like "queep-queep," would fly up and down the watercourse, keeping but a few feet above the bushes, the noise of their wings announcing their presence in the dusk before the birds themselves could be seen. Mr. Blanford says they are excellent eating, the flesh, though rather hard, being of a delicious flavour. The species appears to be confined to the coast region. In the Lebka valley, at Mohabar, only 2000 feet above the sea, but few were seen at the spring in the evening; and at higher elevations none were met with.

Mr. Hume relates, in 'Stray Feathers' (1873), that he met with this species at Gool Mahomed Mehur, Upper Sindh. Only one pair were seen and procured.

Male. Forehead white, crossed by a circular jet-black line, commencing at the opening of the mouth; over each eye a black spot. Throat pale buff. Centre of breast fulvous, with a narrow black bar crossing it in the middle, and another bordering it on the lower side. Rest of plumage of body buff or buffy white, barred narrowly with black. Wings barred with black and white and tipped with buff. Scapulars in some specimens dark buff or rufous, barred with black, in others like the rest of the wing-feathers just described. Primaries dark brown, edged with yellowish white. Tail pale buff, barred with black and tipped with yellowish buff, as are also the upper and under coverts. Iris brown; orbit lemon-yellow. Bill red; feet flesh-colour.

Total length 10 inches, wing $7\frac{1}{4}$, tail $3\frac{1}{4}$, bill along gape $\frac{5}{8}$.

Female. Throat pale buff, spotted minutely with blackish brown. Breast, wings, and back light buff, inclining to rufous on the secondaries, with all the feathers crossed by numerous narrow black lines. Primaries chocolate-brown. Abdomen, flanks, and vent dull white, barred narrowly with black. Tail with its coverts buff, barred with black. Bill light horn-colour; feet yellow.

Total length 10 inches, wing $7\frac{1}{4}$, tail $3\frac{1}{4}$, bill along gape $\frac{5}{8}$.

14. PTEROCLES DECORATUS.

Pterocles decoratus, Cab. Journ. für Ornith. (1868) p. 413; id. Von der Deck. Reis. vol. iii. p. 43, pl. 13 (1869); Finsch & Hartl. Vög. Ost-Afr. p. 565; Von Heugl. Ornith. Nordost-Afr. (1873) Band ii. p. 870.

Hab. Interior of East Africa, Lake Jipe.

I have never seen a specimen of this bird, and only know it from Cabanis's description and figure. He compares it to *tricinctus*, Swains. (=*quadricinctus*. Temm.), but says it is smaller, and gives no description of the wings. It is, however, a very distinct species, and can easily be recognized by the characters given below, most of which are not found in any other known species.

Male. Centre of forehead white, a large spot on each side and throat black. Top of head, neck, and back reddish grey, crossed with narrow lines of black. Superciliary stripe buffy white. Sides of head and breast sandy buff, with a greenish gloss, beneath which is an irregular black bar extending upwards to the shoulders of the wing, succeeded by a broad white band. Abdomen and flanks black, the feathers margined with rufous.

"Total length 9″; bill along gape 7‴; wing 6·5″; tail 2″ 7‴.

Genus SYRRHAPTES.

Body large, comparatively heavy. Bill rather small, delicate, pointed at tip; culmen slightly curved, gonys ascending. Nostrils basal, hidden in feathers. Wings very long, pointed, first primary longest; primaries in one species filamentous. Tail cuneate, median pair of rectrices always lengthened beyond the rest, apical portion attenuated and pointed. Tarsus short, entirely covered by short feathers. Feet tridactyle; hallux obsolete; toes very short, completely hidden in feathers above; the soles bare and scaly. Claws moderate, curved and acute.

Key to the Species.

A. Median rectrices prolonged far beyond the rest.
  a. Primaries filamentous. Breast uniform vinous, tinged with green on upper part, and crossed in the centre by an irregular bar formed of the narrow black lines at the tips of the feathers. Abdomen blackish... 1. *S. paradoxus*.
  b. Primaries not filamentous. Upper part of breast buffy white, irregularly barred with black; rest of underparts pale buff, becoming white on the under tail-coverts ..... 2. *S. tibetanus*.

1. SYRRHAPTES PARADOXUS.

Tetrao paradoxus, Pall. Reis. Russ. Reichs, vol. ii. App. p. 712, tab. F (1773); Gmel. Syst. Nat. (1788) vol. i. p. 755. sp. 30; Lath. Ind. Ornith. vol. ii. p. 643. sp. 20 (1790); Bonnat. Ency. Méth. (1790) tom. ii. p. 205, pl. 93. fig. 1; Pall. Zoogr. Rosso-Asiat. vol. ii. p. 74 (1831).

Heteroclite Grous, Lath. Gen. Syn. Birds, vol. iv. p. 753 (1783); id. Gen. Hist. Birds, vol. viii. (1823) p. 261.

Syrrhaptes paradoxus, Illig. Prodr. (1811) p. 243.

Syrrhaptes pallasii, Temm. Pig. et Gallin. vol. iii. pp. 282, 716 (1815); id. Planch. Col. 95.

Heteroclitus tartaricus, Vieill. Nouv. Dict. Hist. Nat. vol. xiv. p. 453 (1817).

Syrrhaptes paradoxus, Licht. in Evers. Reise nach Buch. p. 134 (1823); Gray, Gen. B. vol. iii. p. 519; Reich. Syn. Av. Gallin. (1851) pl. ccvii. figs. 1807–8; Moore, Ibis (1860) pl. iv. p. 105; Swinh. Ibis (1861) p. 341; Newt. P. Z. S. (1861) pp. 203, 397; Wortley, P. Z. S. (1861) p. 196; Parker, P. Z. S. (1862) p. 257, (1863) p. 516; Swinh. P. Z. S. (1863) p. 306; Radde, Reis. S. O.-Siber. (1863) vol. ii. p. 287, pl. xiv. fig. 3 (egg); Newt. Ibis (1864) p. 185; Salvad. Ibis (1864) p. 228; Von Droste, Journ. für Orn. (1868) p. 406; Müll. Journ. für Orn. (1869) p. 118; Von Homey. Journ. für Orn. (1870) p. 170; Malmgr. Journ. für Ornith. (1870) p. 295; Fritsch, Journ. für Orn. (1871) p. 312; Swinh. P. Z. S. (1871) p. 398; Severzov, Journ. für Orn. (1873) p. 380; Von Heugl. Journ. für Orn. (1874) p. 399; Taczanow. Bull. Soc. Zool. France (1876) vol. i. p. 241; Dress. Ibis (1876) p. 322; id. B. Eur. pt. 53 (1877) pl.; Prjevalsky, in Rowl. Ornith. Misc. pt. ix. p. 382; David & Oust. Ois. de la Chine (1877) p. 389.

Tetrao arenaria, Pall. Zoogr. Rosso-Asiat. (1831) pl. 53, nec text.

Syrrhaptes heteroclita, Vieill. Gal. Ois. vol. ii. p. 64, pl. 222 (1834).

Stepnaya kuritza, Mongolia (Prejevalsky).

Hab. Tientsin, China (*Wortley*); Pekin and Tientsin (*Swinhoe*); Turkestan (*Severtzov*); Mongolia (*Prjevalsky*); Kirghis steppes, Donaria, plains of Petchely (*David & Oust.*).

Pallas's Sand-Grouse is essentially an Asiatic species, making its home in the arid Kirghis steppes, the great Gobi desert, and eastward through Mongolia to the plains between Pekin and Tientsin in North China, where it is especially numerous during the winter. The year 1853 is the earliest in which this bird's presence is recorded in Europe, Möschler having met with it at Sarepta, on the Volga (Naum. vol. iii. p. 305). In 1859 a few specimens were obtained in various parts of Western Europe; but in 1863 a great number of this species, estimated at many hundreds, suddenly appeared in many parts of Europe, constituting a veritable ornithological "Tatar" invasion, as it was aptly called by the historian of this remarkable event. The birds proceeded as far as Ireland, in the west, to the Færoes, in the north, and to Perpignan in France, to the south. Great numbers of them were killed; and it is doubtful if many survived to return to their eastern resorts. The cause of this singular migration has never been ascertained.

About the plains between Peking and Tientsin, according to Swinhoe, flocks of hundreds of this species constantly pass, flying swiftly like the Golden Plover. The natives call them "Sha-chee," or Sand-fowl. They are generally caught in nets; and after a fall of snow a space is cleared, upon which the net is placed and

the place strewed with small green beans. Upon these catching the eyes of the birds, the flocks descend into the snare and are trapped. Great numbers could be taken in this way. Although shy when on the ground, yet on the wing they would dart within a few yards of a person. Their cry was a kind of melodious chuckle. According to native testimony, they are numerous on the great plains of Tartary beyond the Great Wall, where they breed in the sand. In Mongolia, according to Prjevalsky, as given in Rowley's 'Ornithological Miscellany,' this is one of the most characteristic birds, and is found both in the steppes and deserts. In summer they go beyond Lake Baikal in the north to breed, but spend the winter in the Gobi desert and in Ala-shan. They go in enormous flocks, and feed chiefly upon the seeds of *Agriophyllum gobicum*. They fly rapidly, with a peculiar noise of the wings; and at a distance the sound a flock makes is like the sighing of the wind. When flying they utter a note like "*truck-turuck, truck-turuck*;" and small flocks are accustomed to rise in the air and swoop down towards the ground, as Rooks do when migrating. On the ground they run clumsily, and their tracks much resemble those of small mammals. Like the species of *Pterocles*, these birds visit some drinking-place every morning and evening, but never settle without first describing a circle to assure themselves that there is no danger. Prjevalsky also met with this species in the Hoang-ho valley in South-east Mongolia, and also about Kalgan. This species deposits its eggs in the sand; and the female does not sit very closely, but leaves her charge when approached, and also every morning and evening exposes the eggs to the weather, in order to visit the drinking-places. It is a very shy bird, and takes wing generally before one can get near enough to shoot. *Falco hendersoni* persecutes them, but cannot always catch them.

Male. Top of head, occiput, back of neck, a line behind the ear-coverts, and breast grey; on the forehead an ochraceous tinge; chin pale buff. Throat, ear-coverts, and a line on each side of the upper part of the hind neck dark orange. Across the breast a band of dull white, each feather margined narrowly with black. Back and wings vinous, the former barred with black. Outer webs of the greater coverts chestnut, forming a conspicuous bar along the wing when closed. Spurious wing-feathers buff, with a central black line. Primaries light ashy grey on outer webs, dark brown on inner; the fifth to ninth conspicuously margined on both webs with light buff. The first primary considerably elongated and attenuated. Abdomen jet-black. Vent and under tail-coverts pure white. Tail grey, like the primaries, scalloped on the edges of the feathers with buff and tipped with white. The median pair elongated, filamentous, their lengthened portion brownish black. Tarsi and toes thickly covered with short buffy-white feathers. Bill yellowish brown; iris dark brown; nails black.

Total length 14$\frac{3}{4}$ inches, wing to end of first primary 10, tail to end of median rectrices 7$\frac{1}{2}$, bill along gape $\frac{1}{2}$.

Young. Top of head buff, streaked with black. Throat buffy

white, with a narrow black line bounding its lower edge. Upper part of breast grey; abdomen and a spot on the centre of flanks dark chestnut; chest and upper part of flanks, rest of underparts, and under tail-coverts pure white. Entire upper parts buff; secondaries and lesser wing-coverts barred irregularly with black. Greater wing-coverts chestnut on their outer webs. Spurious wing-feathers buff, with a central black line. Primaries grey on outer webs, dark brown on inner, and margined on the innermost ones with buff. Tail dark grey, tipped with white and barred on the inner webs with buff, the outer webs having only a slight buff edging. First primary and median rectrices filamentous, the lengthened portion brownish black. Tarsi and toes covered with greyish feathers. Bill brown.

Total length 10¾ inches, wing to end of lengthened primary 8¼, tail to end of median rectrices 5⅜, bill along gape ⅜.

I have not seen this stage of plumage described by any writer. There are two specimens in the Paris Museum—one a little more mature than the other, with the bar across the breast commencing to show as in the adult male.

Female. Crown and neck buff, striated with black. Throat ochraceous yellow, feathers edged with black. The upper parts like those of the male, but barred more closely with black; and the wing-coverts are spotted with black. Across the throat is a black band; and the sides of the neck and breast are spotted with black. Rest of plumage like that of the male; but the primaries and median rectrices are not so lengthened. The dimensions are about the same as those of the male.

2. SYRRHAPTES TIBETANUS.

Syrrhaptes tibetanus, Gould, Proc. Zool. Soc. (1850) p. 92; id. B. Asia, pt. ii. pl. 12; Reich. Syn. Av. Gallin. (1851) pl. cevii. B. figs. 3020–21; Adams, Proc. Zool. Soc. (1858) p. 502, (1859) p. 186; Hend. & Hume, Lahore to Yark. (1873) p. 279; Prjevalsky in Rowl. Orn. Misc. pt. ix. p. 384 (1877).

Kaling, Tibet and Ladák (Henderson), *Stepnaya Kuritza*, *Tibetskaya* (Prjevalsky).

Hab. Salt Lakes of Ladakh (*Adams*); Karakash valley, Yarkand (*Henderson*); Northern Tibet, steppes of Kokonor (*Prjevalsky*).

Mr. Henderson (*l. c.*) says that this species was met with by the Yarkand Expedition in the Karakash valley towards the end of July, also at a lake twenty miles south-west of Mallik Shāh, and was very abundant at Chāgra, above the Pángong lake, where it flew up and down the stream in flocks of several hundred individuals, uttering all the time a cry like "Yak, yak." It was very tame; and a great many were shot and, unfortunately, eaten.

Lieut. Prjevalsky (*l. c.*) first met with this Sand-Grouse in the Kokonor steppes in flocks of from ten to thirty, but in Northern Tibet saw it in flocks of about a hundred individuals. They were generally on the sandy plains, and fed on the seeds of various grasses and beans. When so engaged they could be approached quite close, and seldom flew above a hundred yards before settling again.

beyond the cell, five argenteous spots surround the margin of the secondaries, whereof those between the lower radial nervule and the third and second median branches are the pupils of black ocelli; that between the first and second median branches is sagittate.

♀. Exp. 1·95. Similar to the male, the colour somewhat paler and the wings more rounded.

Hab. Costa Rica, Irazu (*H. Rogers*).

Obs. This well-marked species belongs to the *E.-phocion* group of the genus (*cf.* Butler, Journ. L. S. Zool. xiii. p. 123), and comes next *E. argentella* and *E. pyracmon*, having the wings similarly shaped. The peculiar tawny-yellow marks of the secondaries render the species very distinct from its allies. This marking on the upper surface is subject to some variation, being more restricted in some specimens and divided by the reddish brown of the inner portion of these wings running through it longitudinally. Mr. Rogers has sent us a good series of this fine species.

2. EUPTYCHIA ROGERSI.

♂. Exp. 1·9. Form as in *E. argentella*: uniform brown above, with a single conspicuous black spot near the margin of the secondaries, between the third median branch and lower radial nervule: beneath paler, a dark red-brown sinuate band crosses both wings through the cell of each; another, nearly straight on the primaries, sinuate on the secondaries, also crosses both wings beyond the cell, outside of which is a pale-brown common band margined exteriorly by a red-brown band hardly traceable on the secondaries; two argenteous spots near the apical angle of the secondaries, and an elongated submarginal one between the first and second median branches; a conspicuous ocellus corresponding to the black spot of the upper surface, the outer ring of which is fawn-yellow, and in the black pupil is a concentric silver spot.

♀. Exp. 1·9. Similar to the male but rather paler and the wings more rounded; the dark bands of the underside appear as indistinct reddish bands on the upper surface.

Hab. Costa Rica, Irazu (*H. Rogers*).

This species also belongs to the *E.-phocion* group of the genus. The presence of a single black submarginal spot on the secondaries, as well as other characters, distinguishes it from its allies *E. argentella*, *E. pyracmon*, and *E. philodice*.

3. EUPTYCHIA VETONES.

♂. Exp. 1·8 in. Primaries slightly falcate; outer margin of secondaries sinuate, most produced at the end of the second median branch: uniform brown above: beneath brown mottled with paler scales; an obscure narrow band crosses the cell of both wings; a broad submarginal pale reddish-brown band, expanding towards the outer margin, on the primaries; a distinct, yellowish, narrow, nearly straight band traverses the secondaries from inside the apical to inside the anal angle; a distinct ocellus with an argenteous crescent

inside between the second and third median branches; argenteous spots on either side of this ocellus.

♀. Exp. 1·95 in. Like the male, but the upperside crossed with reddish bands corresponding to the markings of the underside; the ocellus of the underside shows above as an indistinct black spot.

Hab. Costa Rica, Irazu (*H. Rogers*).

Obs. A close ally of *E. ithama*, Butler (Lep. Ex. p. 9, t. iv. f. 4), from which it differs in the much clearer definition of the markings of the underside, the extracellular transverse cross band of the secondaries being yellowish and not reddish as in *E. ithama*. The male of *E. ithama* is not known to us; but, comparing the females of the two species, the red markings of the upper surface of the southern race are much more conspicuous than in the northern. Mr. Butler's figure of *E. ithama* (the type of the species being before us) is much too pale in general tint, and the cross bands far too conspicuously shown.

4. LYMANOPODA EUOPIS.

♂. Exp. 2·2 in. Primaries with apical angle rather pointed, outer margin of secondaries rounded; rich brownish-black; black ocelli with white pupils between the radial nervules and the second and third median branches, halfway between the cell and the outer margin; a transverse row of obsolete black spots beyond the cell of the secondaries: beneath reddish-brown, yellowish beyond the cell; a bicurved row of five distinct black ocelli with white pupils between the cell and the outer margin of the primaries, on either side of this row a sinuate black band, the distal one reddish towards the apical angle; at the end of the cell a dusky yellowish spot surrounded by a black line: secondaries beneath with dark red-brown bands from costal margin across the cell, and beyond the cell from the third median branch to the inner margin; a submarginal band made up of outwardly concave concentric marks; across the wing beyond the cell runs a band of seven small white-pupillated black ocelli, each on a patch of rich red-brown.

♀. Exp. 2·22 in. Brown; primaries with six black white-pupillated ocelli arranged in a double curve beyond the cell on a tawny-yellow ground; secondaries with distal half (except the margin) tawny-yellow, a band of six black spots crosses the wings beyond the cell: beneath tawny-yellow, the base of the primaries rather darker, ocelli and markings of primaries as in the male; secondaries almost uniform tawny-yellow, the ocelli and markings almost obsolete.

Hab. Costa Rica, Irazu (*H. Rogers*).

Obs. A very distinct species of this Andean genus, the first as yet found north of the Isthmus of Panama.

5. PEDALIODES TRIARIA.

♂. Exp. 2·45 in. Allied to *P. praxithea* (Hew. Ex. Butt. *Pronophila*, pl. v. f. 28, 29), differing in the more pointed primaries; the orange band of the same wings is narrower and of nearly equal width; in the secondaries the orange spot, instead of being restricted

to the apical angle, extends halfway along the outer margin. Beneath the difference between the two species is more obvious; the whole under surface of the secondaries in *P. triaria* is dark brown mottled with black, two broken black bands crossing the wings, one through the cell, the other beyond it; a row of six submarginal ocelli with white pupils, that between the first and second median branch being much the largest and most conspicuous; the mottling of the apical area of the secondaries is upon a yellowish ground-colour; the light ground-colour at this part, and over the distal third of the secondaries in *P. praxithea* is wanting.

Hab. Costa Rica, Irazu (*H. Rogers*).

6. PEDALIODES CREMERA.

♀. Exp. 2·9 in. Primaries entire, apical angle somewhat produced, outer margin of secondaries sinuated; dark brown; primaries crossed by a broad submarginal band of obscure tawny, the inner edge of which is concave, and the outer serrate running parallel to the outer margin: beneath mottled with blackish brown, in the tawny band of the primaries, between the first and second median branches is a white-pupillated ocellus; an irregular dark line follows the outer margin of the secondaries halfway between the outer margin and the cell; between the first and second median branches near the margin is a large black ocellus with a white pupil, and two smaller ones near the anal angle.

Hab. Costa Rica, Irazu (*H. Rogers*).

7. OXEOSCHISTUS ROGERSI, sp. n.

♀. Exp. 3 in. Allied to *O. phaselis* (Hew.), differing above in having a conspicuous row of tawny oval spots, separated by the nervules running parallel to the outer margin, the three spots separated by the first and second median branches, and that between the middle and upper radials bearing large dark brown spots of the same brown colour as the rest of the wings: beneath, the markings resemble those of *O. phaselis*, except that the marginal region of the primaries is strongly marked with fulvous corresponding with the markings of the upper surface.

Hab. Costa Rica, Irazu (*H. Rogers*, type *mus. nostr.*); Chiriqui (*Ribbe*: *mus.* O. Staudinger).

Dr. Staudinger's Chiriqui specimen exactly resembles ours, except that it is rather paler, being not so fresh.

O. phaselis has been placed in the genus *Pronophila* by Mr. Hewitson, and in that of *Dædalma* by Mr. Butler (Cat. Satyr. p. 184); but, so far as we can see, its proper place is in the genus *Oxeoschistus*, with the members of which it agrees in neuration, and with some of them in style of coloration.

NYMPHALIDÆ.

8. PHYCIODES THEBAIS, sp. n.

Exp. 1·5 in. Allied to *P. orseis*, Edwards, ex California, as to the position of the marks of the upper surface, and as to the coloration of

the under surface of the wings: the markings above are pale yellowish instead of deep fulvous, and the submarginal row of ocelli of the secondaries is almost obsolete; the outer margin of the primaries is more sinuate, being slightly concave about the middle, instead of following a simple convex outline: beneath the dark marks near the outer margin and inner angle of the primaries are more clearly defined.

Hab. Mexico, Mountains of Oaxaca (*Fenocchio*, type); Guatemala, Highlands near Dueñas, 4800 ft. (*S. & G.*).

Mus. nostr. Two examples.

9. PHYCIODES BOUCARDI, sp. n.

Exp. 1·3 in. Form of *P. elada* (Hew.), which it somewhat resembles on the upperside, but from which it differs completely on the underside. The tawny spots are all of nearly equal size, that halfway between the end of the cell and the apex of the primaries (divided into three by the nervules) being slightly the largest. The spots on the secondaries beyond the cell are arranged in three concentric lines, the submarginal one consisting of a series of lunules, the middle one consisting towards the anal angle of obsolete ocelli. Beneath nearly uniform tawny, the secondaries being paler; the basal two thirds of both wings crossed irregularly with fine dark lines; the outer third of the primaries submarginally dark, enclosing round tawny spots; secondaries with a dark patch about the middle of the outer margin, and a row of black spots corresponding to the obsolete ocelli of the upperside.

Hab. Mexico, Putla (*Rébouch*).

Mus. nostr. One example.

We are indebted to Mr. Boucard for the possession of this species.

10. PHYCIODES SUBOTA, sp. n.

♂. Exp. 1·7 in. Allied to *P. ardys* (Hew.), from which it differs on the upperside in the submarginal lunate lines of the secondaries being obsolete, and in having the bases of both wings without the faint marking seen in *P. ardys*. Beneath, the deep-tawny spots and pale fulvous wash are replaced by deep brown and pinkish grey; a well-defined band of pale spots crosses the middle of the secondaries.

♀. Exp. 1·95 in. Similar to the ♂, but larger, and all the marks, especially the band crossing the secondaries, better-defined.

Hab. Guatemala, valley of the Rio Polochic (*S. & G.*); Costa Rica, Irazu (*Rogers*).

Mus. nostr.

The Costa-Rica specimens are slightly aberrant, the base of the wings beneath being darker and the cross band of the secondaries narrower.

11. PHYCIODES DRYMÆA, sp. n.

♂. 1·4 in. Allied to *P. ardys*, Hew., and the last-described

species; from both it differs in the absence of the band crossing the secondaries, its place being occupied by a row of very small spots: beneath, the markings of the secondaries are very indistinct, and consist chiefly of dark marks near the region of the anal angle, and one projected from beyond the middle of the costa halfway across the wing.

Hab. Guatemala; hacienda "las Nubes;" valleys of the rivers Chisoy and Polochic.

Mus. nostr.

12. PHYCIODES CYNEAS, sp. n.

♂. Exp. 1·45 in. Allied to *P. leanira*, Feld., ex California, from which it differs in having a well-defined submarginal row of red spots on the secondaries above, and also some red spots near the middle of the outer margin of the primaries, but none on the inner part of the wing: beneath, the dark markings of *P. leanira* across the cell and towards the costa of the secondaries are wanting; but, as in that species, the nervules are black.

Hab. Mexico, mountains of Oaxaca (*Fenocchio*).

Mus. nostr.

13. PHYCIODES NEBULOSA.

♂. Exp. 1·5 in. Belongs to the *P.-ardys* (Hew.) group. Markings of wings above deep tawny red; wings more elongated than in *P. ardys* and its allies; base of the secondaries with obsolete tawny marks; secondaries beneath pale greyish, region of the outer margin dark, and a dark subtriangular mark from the costa halfway across the wing.

Hab. Guatemala, hacienda "las Nubes" (*O. S.*).

Mus. nostr.

Taken in the beginning of February 1874.

14. ERESIA MECHANITIS, sp. n.

♀. Exp. 2·2 in. Like *E. eunice* (Hübn.), but differing in having the apical half of the primaries crossed with two well-defined yellowish bands: the inner one is but slightly indented and not distinctly broken as in *E. eunice*; the outer one crosses the apex as a distinct band instead of being an obsolete spot.

Hab. Nicaragua (*Janson*).

Probably a northern race of *E. eunice*, but differing slightly from all the forms of that species found in the Amazonian region.

15. ERESIA DRYPETIS, sp. n.

♂. Exp. 2·2 in. Differs from *E. eunice* and the last-described species chiefly in the narrowness and direction of the transverse band of the secondaries. The dark mark over the median nervure of the primaries is obsolete; the dark band crossing the primaries is continuous.

Hab. Panama (*McLeannan*, type); Guatemala, interior (*S. & G.*).

16. TIMETES PHIALE, sp. n.

♂. Exp. 2·5 in. Closely allied to *T. corita*, Bates, from which species the male hardly differs: the region of the costa of the secondaries is suffused with the reddish tawny colour of the apical angle; and beneath the general tint is paler.

♀. Exp. 2·5 in. Differs from ♀ *T. corita* in general tint of the wings being brick-red instead of rich brown, the transverse markings of the wings being much more clearly defined; beneath the markings are all very indistinct, both wings being crossed by a common rufous band.

Hab. Guatemala, Volcano of Atitlan (*Salvin*).

Mus. nostr. Three examples.

Taken at the end of January 1874, in forest, at an elevation of about 4000 feet.

17. ADELPHA FALCATA, sp. n.

♂. Exp. 2·2 in. Primaries elongated, outer margins concave, dark brown; both wings with a common white band extending from the space above the second median branch of the primaries to the anal angle of the secondaries, where the usual tawny spot is absent. A tawny spot extends curving outwards from about the middle of the distal half of the subcostal nervure of the primaries towards the margin; the outer margin of this spot is deeply sinuated, apex narrowly white. Beneath rich tawny; the white band as above, but with a dark margin on either side; the tawny spot is paler and rounded; a submarginal row of glaucous spots, obsolete about the middle of the margin of the primaries; two glaucous spots in the cell and one beyond it; two transverse series across the base of the secondaries, all with dark margins.

♀. Similar to the ♂, but larger (exp. 2·55 in.); the primaries being less falcate.

Hab. Guatemala, valley of the Rio Polochic.

Mus. nostr.

Obs. In pattern of coloration this species somewhat resembles *A. iphicla* (L.); but it may be at once distinguished by the strongly falcate wings, the absence of the tawny spot at the anal angle of the secondaries, and the coloration of the under surface.

18. ADELPHA DIOCLES, p. n.

♂. Exp. 2·1 in. Dark brown, with three darker submarginal bands to both wings; a common white band crosses both wings from above the second branch of the median nervure of the primaries to the anal angle, near which is a tawny spot; a tawny spot runs from the costa of the primaries, parallel to the margin, nearly as far as the first median branch, and is separated from the white band by an oblique dark line; two dark-margined tawny spots cross the cell, one at the end and one in the middle. Beneath the bands are as on the upperside; the margins of both wings are bluish white, with a marginal and central tawny line; this marginal band is separated from

the central bands by a tawny dark-edged band; the cell of the primaries is whitish at the base and crossed by a dark-margined spot of the same colour near the end; beyond it is a similar mark running into the central white band.

Hab. Volcano of Chiriqui (*Arcé*).

Mus. nostr.

A beautiful and distinct species, coming perhaps nearest *A. syma* (Hübn.) of S. Brazil.

PAPILIONIDÆ.

19. PAPILIO SYEDRA, sp. n.

♂. Exp. 5 in. Allied to *P. abderus*, Hopff., and *P. asclepius*, Hübn., the yellow submarginal lunules of the secondaries being absent as in the former of these two species. From it the present species differs in the row of black lunules which traverse the secondaries beneath, beyond the yellow band, being distinctly margined on their inner convex edges with maroon, the outer concave edges enclosing an area of blue; these marks in *P. abderus* are respectively grey and yellow: the submarginal lunules beneath on the secondaries are deeper maroon than in *P. abderus*.

Hab. Volcano of Chiriqui (*Arcé & Ribbe*).

Mus. nostr. et O. Staudinger.

We have long possessed a single specimen of this species. Having recently seen others in the collection of Dr. Staudinger, we have been able to test the stability of the characters by which it differs from *P. abderus*.

5. On a small Collection of Birds from the Ellice Islands. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c. With a Note on other Birds found there, by the Rev. S. J. WHITMEE.

[Received January 21, 1878.]

The Rev. S. J. Whitmee has been so kind as to submit to me a small parcel of birds obtained for him by a collector in the Ellice Islands. The few skins do not give materials for a large paper; but I trust that the details connected with the synonymy of *Anous cæruleus* will be found interesting.

1. ARDEA SACRA, Gm.; Finsch & Hartl. Faun. Central-Polyn. p. 201 (1867).

Two specimens in changing plumage, one with the white dress nearly complete, the other still with plentiful remains of ashy-brown feathers.

2. ANOUS CÆRULEUS.

I must acknowledge the assistance which I have received from Mr.

Howard Saunders's paper on the Sterninæ in the 'Proceedings of this Society for 1876; and it is solely through want of material that he was unable to discriminate the two Grey Noddies of the Pacific, as I am able to do from the receipt of the present specimens.

Two examples are in the collection now sent; and I saw at once that they belonged to a different species from the bird marked as *A. cæruleus* in the national collection. The following is a description of one of these specimens:—

Suprà cinereus, alis caudâque quam dorsum vix saturatioribus: primariis duobus externis extùs magis nigricantibus: pileo colloque undique puriùs canis, fronte et facie anticâ albicantibus: maculâ parvâ anteoculari nigrâ: corpore reliquo subtùs cinereo, subalaribus externis et margine alari canescentibus: rostro nigro.

Long. tota 9·3, rostri a fronte 0·95, alæ 6·6, caudæ 2·75, rectricis penultimæ 3·85, tarsi 0·9.

It appears that this small species is unquestionably the true *Sterna cærulea* of Bennett, and that Mr. Gould was perfectly right when he separated the North-Australian bird as *Anous cinereus*, and that he was wrong in sinking this name, published in 1845, in favour of Néboux's, which was not published until 1846. The following appears to be the true synonymy of the two species.

ANOUS CÆRULEUS.

Sterna cærulea, F. D. Bennett, Narr. of a Whaling Voyage, ii. App. p. 248 (1840).

Sterna cendré, Néboux, Rev. Zool. 1840, p. 291.

Sterna tereticollis, Lafr. Rev. Zool. 1841, p. 242.

Procelsterna tereticollis, Lafr. Mag. de Zool. 1842, pl. 29.

Anous parvulus, Gould, P. Z. S. 1845, p. 104; Cassin, U.S. Expl. Exp. Birds, p. 393 (1858); Gray, Cat. B. Pacific Isl. p. 60 (1859).

Anous gracilis, Gray, Gen. B. iii. p. 661 (1846, lapsu).

Stolida cinerea, Néboux, Voy. Vénus, Atlas, pl. 9 (1846, nec Gould).

Megalopterus plumbeus, Peale, U.S. Expl. Exp. p. 285 (1848).

Anous cinereus, Prévost et Des Murs, Voy. Vénus, v. p. 276 (1855); Finsch & Hartl. Faun. Central-Polyn. p. 239, taf. xiii. fig. 4, taf. iv. figs. 4 & 5 (1867).

Procelsterna cinerea, Bp. C. R. xlii. p. 773 (1856).

Anous cinerea, Gray, Hand-l. iii. p. 123. no. 11088 (1871).

Diagn.: *Minor, schistaceo-cinereus, pileo et corpore subtùs toto vix pallidiùs cinereis; secundariis externis angustissimè ad apicem albo limbatis; subalaribus schistaceo-cinereis.*

Hab. in insulis orientalibus maris Pacifici.

ANOUS CINEREUS.

Pelecanopus pelecanoides, Gray, List of *Anseres*, p. 180 (1844).

Anous cinereus, Gould, P. Z. S. 1845, p. 104; id. B. Austr. fol. pl. 46 (1848): Reichenb. Vög. Neuholl. p. 181. no. 536 (1850).

Anous tereticollis, Gray, Gen. B. iii. p. 661 (1846).

Procelsterna albivitta, Bp. C. R. xlii. p. 773 (1856); Gould, Handb. B. Austr. ii. p. 420 (1865).

Sterna cinerea, Schleg. Mus. P.-B. *Sternæ*, p. 38 (1863).

Anous albivitta, Gray, Handl. B. iii. p. 123, no. 11089 (1871).

Anous cæruleus, Saunders, P. Z. S. 1876, p. 671 (*nec* Bennett).

Diagn.: *Major, suprà cinereus; pileo et collo undique et corpore subtùs toto albicanti-cinereis; secundariis conspicuè albo terminatis; subalaribus albis.*

Hab. In Australiâ septentrionali et orientali usque ad insulas Pacificas 'Friendly' dictas.

Dr. Finsch, in his paper read before the Society on the 20th of November last, records this species from Eua in the Friendly group. He recognizes the distinctness of the two species; but there is no need to restore the name of *Anous albivitta*, as the title *cinereus* was given by Gould in 1845, and Néboux's *A. cinereus* was not published till 1846.

3. ANOUS STOLIDUS (L.); Saunders, P. Z. S. 1876, p. 669.

Two specimens.

4. ANOUS LEUCOCAPILLUS, Gould; Saunders, P. Z. S. 1876, p. 670.

A single example of a Noddy apparently referable to this species.

5. STERNA ANÆSTHETA (Scop.); Saunders, P. Z. S. 1876, p. 664.

One specimen.

6. GYGIS CANDIDA (Gm.); Saunders, P. Z. S. 1876, p. 667.

One specimen.

Besides the above-named species there are some eggs, two of a Noddy Tern, sent with the skins of *Anous stolidus* and *A. leucocapillus* and probably belonging to the former, and three eggs apparently of a Duck. In one box were also two wings of a small Parrot.

Note on the preceding Communication. By the Rev. S. J. WHITMEE, F.R.G.S., C.M.Z.S.

During 1876 Mr. Fritz Jansen, a Danish Botanical student who had been residing with me in Samoa for a year, collecting the flora of those islands, went on a cruise through several groups of islands to collect for me the flora and as much as possible of the fauna existing there. In addition to the birds included in the foregoing list, he saw a *Carpophaga* in the Ellice Islands; and the Frigate-bird (*Fregata aquila*) also occurs there. In fact, the latter bird is domesticated by the natives; and when I was in those islands in 1870 I saw scores of them about the villages sitting on long perches erected for

them near the beach. The natives procure the young birds and tie them by the leg and feed them till they are tame. Afterwards they let them loose, and they go out to sea to get their food, and return to their perches in the villages at intervals.

I cannot say to what species the *Carpophaga* is referable, not having seen it myself. Mr. Jansen procured young ones in May and June; but he, thinking they were the same as the Pigeon found in Samoa (*C. pacifica*), did not preserve any specimens. Natives of the Ellice Islands who were in Samoa when I left there, told me their pigeon is like the Samoan species, "except that it is smaller, owing to its food being less plentiful." That is their own explanation of the cause of difference. They say it feeds almost entirely on the fruit of the native fig (*Ficus*, sp.). They also tell me it is not gregarious in those small islands as it is in Samoa during part of the year. As far as they know it does not migrate, but may always be found sparsely distributed over the islands.

So far as I have been able to learn, no Pigeon occurs in the Gilbert Islands; but a *Carpophaga* occurs in the Union or Tokelau Islands. Mr. Jansen tells me that all the birds he procured in the Ellice Islands, which are included in the foregoing list, are found also in the Union Islands. This may probably be considered nearly a complete list of the avifauna of those small atolls.

6. Note on the Dentition of *Cuscus*.

By EDWARD R. ALSTON, F.L.S., F.Z.S., &c.

[Received January 25, 1878.]

In reporting last year on the Rev. G. Brown's collection from New Ireland and the vicinity[1], I observed that the two specimens of *Cuscus* contained in it differed from the characters usually given of *C. orientalis* in having but two small teeth behind the large lower incisors, and in wanting the small extra upper premolar. At the same time I corroborated Mr. Waterhouse's remark[2] that the number of functionless teeth is not always trustworthy in this group, and observed that it must be left to future investigation to show whether the New-Ireland Phalangers were or were not constant in the peculiarity of their teeth.

Mr. Sclater has now kindly placed in my hands a second small collection received from Mr. Brown, consisting of one example of *Mus browni*, Alst., one of *Uromys rufescens*, Alst., ten of *Belideus ariel*, Gould, and eight of *Cuscus orientalis*, Pall. All these species were represented in Mr. Brown's former consignment; but the series of the last-named now available enables me to decide the question as to its dentition.

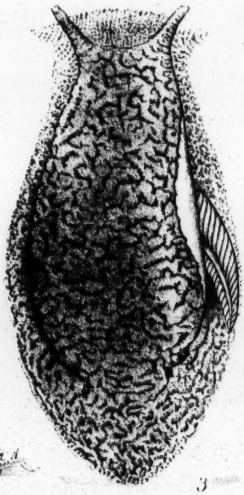
In *four* of these eight specimens the extra upper premolar is

[1] P. Z. S. 1877, p. 126.

[2] Nat. Hist. Mamm. i. p. 265.









present, being in one case nearly as large as the constant first premolar, while in another it is a mere rudiment; in the other *four* examples it is altogether absent. In the number of the functionless teeth of the lower jaw (which I carelessly called small incisors in my previous paper, but which Professor Owen regards as the homologues of the canines and anterior premolars[1]) there is the greatest possible variety, one example having *three* in one ramus and *none* at all in the other; three, however, appears to be the normal number. These differences have nothing to do with the age of the individual; for the extra upper premolar is absent in a half-grown animal, and the small lower teeth are present in one of evidently great age.

It appears, therefore, that the dentition of this genus is even more variable than has been believed, and that the existence of the additional teeth must be dropped from the specific characters of *C. orientalis*. I may add that in several of these specimens, which are all females, the dark dorsal stripe is absent; this also has been regarded as a diagnostic character.

7. Descriptions of three new Species of Opisthobranchiate Mollusca from New Zealand. By S. T. CHEESEMAN, F.L.S., Curator of the Auckland Museum.

[Received January 29, 1878.]

(Plate XV.)

From a number of new species of Opisthobranchiate Mollusca collected in or near Auckland Harbour I have selected for description the three following prominent forms.

1. PLEUROBRANCHUS ORNATUS, n. sp. (Plate XV. figs. 1, 2.)

Body 3–4 inches long, broadly elliptical, depressed, nearly equally rounded at both ends, colour varying from pale buff to a clear reddish brown, with irregularly disposed blotches of a rich dark red-brown; mantle large, extending over and concealing both head and foot, quite smooth, margin thin, entire; dorsal tentacles short, stout, abruptly truncate, finely transversely wrinkled, approximate at their origin, but gradually diverging at their apices; colour reddish brown tipped with white; eye-specks black, placed a little distance behind the tentacles, embedded in the integument, but appearing through it; oral tentacles united in front by a thin semicircular expansion which forms a veil concealing the mouth, and which is carried in advance of the foot; mouth roundish, with fleshy lips; buccal plates two, regularly reticulated; odontophore with numerous rows of similar unciform teeth. Branchial plume placed in the groove between the foot and the mantle, very large,

[1] Odontography, i. p. 382.

composed of about 22–24 pectinations; foot oblong, thin and flexible, pale waxy white.

Shell internal, ½ to ¾ inch long, squarish oblong, thin and membranous, semitransparent, slightly iridescent, closely marked with somewhat irregular concentric striæ or folds; colour varying from nearly white to pale pinkish or tawny brown. Spire minute, obscure, mouth occupying the whole of the undersurface.

My first specimens of this handsome species were obtained from under stones between tide-marks in Auckland Harbour; where, however, it is by no means common. Near Waiwera and in some other localities on the Hauraki Gulf it is much more frequently met with. It is easily kept alive in an aquarium, but is very sluggish in its movements.

2. PLEUROBRANCHÆA NOVÆ-ZEALANDIÆ, n. sp. (Plate XV. fig. 3.)

Body oval, convex, thick and fleshy, smooth and lubricous to the touch, but the whole surface nevertheless covered with minute puckers and folds. Colour light grey, copiously streaked with irregular anastomosing lines of dark greyish-brown, and sprinkled with numerous minute and almost microscopic white dots. Mantle smooth, not nearly so long as the foot, and not concealing the branchiæ, rather broader on the right side; oral veil broad, extending over and concealing the mouth, in front semicircular, and with a delicate fringed margin, but at each side produced into a short tentacle-like lobe; mouth large, round, in a state of rest concealed in the sulcus between the oral veil and the foot, but capable of being greatly protruded in a proboscidiform manner; buccal plates two, large, finely and regularly reticulated or faceted; odontophore broad, with numerous rows of similar unciform teeth; tentacles dorsal, wide apart, short and stout, projecting outwards, folded down the outer side, tips obliquely truncate; eyes minute, black, placed within the integument at the inner bases of the tentacles, quite internal, and not to be seen without dissection; foot long, extremely flexible, sole pale ashy grey; branchial plume often over an inch in length, and free for half that distance; pectinations about 17, finely ciliated; shell none; length 2·5 to 3·25 inches.

This species is very abundant in Auckland Harbour, usually affecting sandy or muddy localities. In the winter and spring months large numbers are often exposed at neap tides, having probably come into shallow water to deposit their ova. Capt. Hutton, of the Otago Museum, informs me that he has collected the same species at Port Nicholson. It is hardy and not easily killed, and may be kept in confinement for a long time. When in a healthy state it is by no means inactive, crawling along by means of its muscular foot much more quickly than might be expected. It has a curious habit of floating in a reversed position, just under the surface of the water; and I have also observed it swimming by means of rather violent vertical undulations of its body.

3. ACLESIA GLAUCA, n. sp. (Plate XV. fig. 4.)

Body from 3 to 5 inches long, about ovate when at rest, but capable of considerable extension, a little contracted behind the head, then elevated, and suddenly sloping to a point posteriorly; entirely covered with numerous simple and branched tentacle-like processes, the largest of which are sometimes eight lines long. Colour on the sides pale greyish-brown, passing on the back into a dull sea-green; the whole surface with numerous irregularly shaped black blotches that are longest on the back. Along the back there is also a double row of from 8 to 12 emerald-green specks, each surrounded with a zone of umber. Dorsal tentacles $\frac{3}{4}$ inch long, folded down the outer side so as to appear tubular, beset with filiform appendages. Labial tentacles similar in shape, but rather larger. Branchial cavity large, protected by the folded-in edges of the mantle, branchiæ quite internal; foot long and narrow, pointed behind, without side-lobes as in *Aplysia*, sole pale sea-green; mouth roundish, placed under the head; odontophore with very numerous rows of simple hooked teeth; gizzard strengthened with large triangular calcareous plates; shell none.

Like many of the species of the allied genus *Aplysia*, this animal possesses the power of emitting a purple fluid from the edges of the mantle, but only in small quantity; and it may often be handled without any thing of the kind being observed. All my specimens are from Auckland Harbour, and were obtained from rather sandy localities near the extreme verge of low-water mark.

EXPLANATION OF PLATE XV.

Fig. 1. *Pleurobranchus ornatus.*
2. Shell of the same.
3. *Pleurobranchæa novæ-zealandiæ.*
4. *Aclesia glauca.*

8. On a new Species of the Genus *Buceros*. By ARTHUR, Marquis of TWEEDDALE, F.R.S., President of the Society.

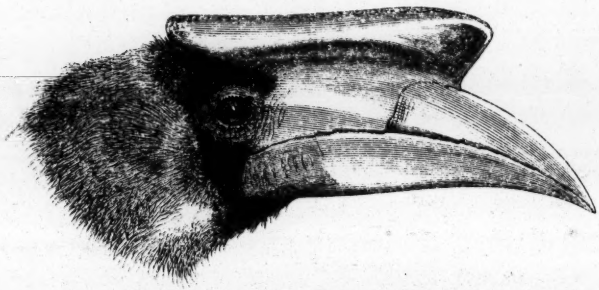
[Received February 2, 1878.]

In a collection of birds made at Amparo (in the extreme south of the Philippine island of Leyte), and sent to me by Mr. Everett, are some examples of a Hornbill of the genus *Buceros*, which differ from the two other known Philippine species[1] sufficiently to require description. The characters which differentiate the large *Buceros* of Mindanao, *B. mindanensis*, from the one which inhabits Luzon were stated some months ago before this Society (see P. Z. S. 1877, 543). But in those two species the form and general contour of the bill and casque are alike, whereas in this second representative form of *B. hydrocorax* the form of the casque is very different. The colouring of the bill resembles that of *B. mindanensis*; and in

[1] *B. hydrocorax* and *B. mindanensis*.

the general colouring of the plumage there is little or no difference. It is the form of the casque that provides the differential specific character. Instead of being produced forward as in *B. hydrocorax* and *B. mindanensis*, with an abrupt, compressed, and elevated anterior margin, the superior plane of the casque loses itself and dies away on the culmen. The superior plane of the casque is not flat but arched along its length, the crown of the arch during the course of its anterior half forming an almost acute ridge. In the

Fig. 1.



Side view of head of *Buceros mindanensis*.

Fig. 2.



Head of *Buceros mindanensis*, from above.

two known species the contour of the superior flat plane of the casque is that of an oval, the posterior end being rounded and the anterior pointed. In this Leyte species the posterior end is also rounded; but the sides, instead of gradually expanding to the greatest breadth of the superficial area and then gradually contracting to the apical point, continue in almost parallel lines for about two thirds of the length of the major axis of the casque, and then terminate abruptly, forming corners from which the sides of the remainder of the casque recede until they reach the culmen.

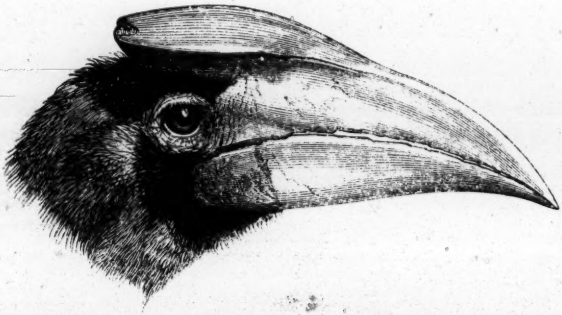
[S. Leyte, ♂ (adult), September. Iris light yellow; orbital skin darkest sepia, almost black; gular skin dark Indian-yellow; feet coral-red; nails dark brown-grey.—*Everett.*]

The iris of an adult male from the island of Panaon is recorded by Mr. Everett as being "pale blue."

Distinct slightly corrugated basal plates are present on the walls of the mandibles of the adult birds.

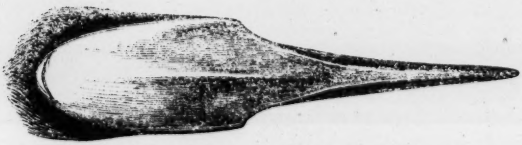
The first plumage has little resemblance to that of maturity. The space between the rami of the mandible and the patch at the base of the sides of the mandible is dirty brown. The head, neck, breast,

Fig. 3.



Side view of head of *Buceros semigaleatus*.

Fig. 4.



Head of *Buceros semigaleatus*, from above.

and abdomen are dirty greyish fulvous-white, the feathers of the head, neck, and upper breast being ferruginous at their insertions and grey at their tips; and such is the character of the thigh-coverts and ventral plumage. The upper tail-coverts are also dirty greyish-fulvous white, with either brown or ferruginous bases. The dorsal plumage and the quills and other wing-feathers are brown, the quills dark brown, with broad terminal dirty greyish-fulvous white marks or edgings. The middle pair of rectrices are for two thirds of their length pale brown, the apical third being white or dirty creamy white. All the other rectrices have the basal part to a greater or less extent pale brown, or pale rusty-brown. In some, probably the new feathers, the whole rectrix is white. In the plumage described

the bill is black with a yellow tip, and the casque is not formed. The colouring of the soft parts of the young bird is noted by Mr. Everett as follows:—"S. Leyte, ♀, September. Iris dark brown; bill black; orbital skin greenish yellow; gular skin yellow; legs and feet dark orange. *b.* S. Leyte, ♀, October. Iris grey-brown; bill jet-black, tip orange; feet dull orange."

The bill remains black after the bird has assumed the completely mature plumage and after the casque is almost perfectly formed.

	Dimensions.				Casque.		
	Wing.	Tail.	Tarsus.	Bill from gape.	Length.	Breadth.	Sides.
	in.	in.	in.	in.	in.	in.	in.
♂	15·80	15·00	2·20	5·85	4·90	2·00	3·35
♀	14·30	14·50	2·20	5·30	4·75	1·65	3·30
♂ juv.	14·50	14·00	2·20	5·20	4·80	1·40	0·00

For this Hornbill I propose the title of *Buceros semigaleatus*.

9. Contributions to the Ornithology of the Philippines.—No. V. On the Collection made by Mr. A. H. Everett in the Island of Negros. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received January 30, 1878.]

Mr. Everett has been continuing his zoological researches in the Philippine Islands unremittingly, and, by the consignment of a collection of birds made during the month of August last in the neighbourhood of Nueva Valencia and Dumaguete, situated at the extreme south of Negros, has enabled me to continue these contributions to the ornis of the archipelago.

"The southern extremity of Negros," Mr. Everett writes, "which is the most mountainous part of the island, and where I hoped to find accessible virgin forest, is simply one vast field of maize, sugar-cane, and hemp, perfectly cleared, even far up the steep sides of the mountains, and is a very poor district indeed for birds." Notwithstanding, Mr. Everett in the space of one month secured 56 distinct species, 24 of which are now recorded for the first time from Negros. Of these 24 there are 6 new to the Philippine area, 3 of which are new to science.

Species not hitherto known as being inhabitants of the Philippines:—

Collocalia francica.
Butalis latirostris.
Limosa ægocephala.
Dasycrotapha speciosa.
Zosterops nigrorum.
Macropygia eurycerca.

The last three are new species.

The exact habitat of one previously recorded Philippine bird has been determined by Mr. Everett,

Eudromias geoffroyi;

and there now remain 38 Philippine birds of which the precise habitat still continues undecided.

The number of species known to inhabit the island of Negros previous to the date of Mr. Everett's visit was about 59[1]; and to this number he has added 24, and raised the total of known Negros species of birds to 83.

The remarkable species *Dasycrotapha speciosa*, a new type of Timeliine genus, and the discovery of a second Philippine species of *Collocalia* are the most interesting results of Mr. Everett's ornithological researches in Negros.

1. Cacatua hæmaturopygia (1).

[Valencia, ♂, August.]

2. Tanygnathus luzonensis (3).

[Valencia, ♂, ♀, August.]

Of two examples (♂) shot in August, one has the crown and occiput blue, the other green; in both the uropygium is green.

3. Loriculus regulus (6).

Loriculus regulus, Souancé; Rowley's Ornith. Misc. pt. vii. p. 238, pl.

[Dumaguete, ♂, ♀, August: bill orange-red; cere orange; feet lighter orange; claws black. ♀ (juv.), August: feet dirty ochre-yellow.]

The series consists of eight examples, four marked as belonging to males, and four to females.

The males are in the adult typical plumage of the species. Two of the females have the occiput faintly golden, and traces of the orange nuchal band. The two other females have the whole head green, and the crimson upper tail-coverts covering only half the length of the rectrices. No blue about the chin, cheeks, and throat.

The male, as figured by Keulemans (*l. c.*), only exhibits a red band across the throat, whereas the lower throat and breast possess a large orange-red plastron.

4. Limnaëtus philippensis (14).

[Valencia, ♀, August: iris pale brownish grey; bill black; lores and cere dull greenish; feet light dirty yellow; claws black.]

Pure white underneath, the thigh-coverts being very faintly barred

[1] Dr. Steere added 21 species to the 38 recorded by me (Tr. Z. S. ix. p. 252) as known from Negros. Dr. Steere collected partly in North Negros, and partly at Dumaguete in the South; but, from the general term "Negros" being frequently all that is given as the locality by Mr. Sharpe (Tr. L. S. 2nd Series, Zool. vol. i.), it is impossible in many cases to determine the exact part of the island in which Dr. Steere's specimens were obtained.

with irregular lines of pale fulvous. Head and neck pure white, a few feathers with brown terminal drops. Back brown, each feather narrowly margined with pale tawny rufous. Uropygium and upper tail-coverts pale earthy brown, some of the coverts tipped with pure white. Minor wing-coverts brown, edged with dirty white. Major coverts pale earthy brown, with paler margins and white terminal edges. Quills dark brown, more or less blotched with paler brown and white. Rectrices above rich brown, with five or six very narrow cross dark brown irregular bands, a broader dark brown subterminal band. Shafts pure white for three fourths of their length. Rectrices underneath albescent, the brown bands being more conspicuous than above.

Wing 15·20 inches, tail 12·00, tarsus 3·50, culmen 1·50. Nuchal crest-plumes dark brown, tipped with white; length 3·30.

5. HALIASTUR INTERMEDIUS (17).

[Valencia, ♀, August.]
In full plumage.

6. MEROPS PHILIPPINUS (35).

[Valencia, ♂, ♀, August. Dumaguete, ♀, August.]
The series (7) consists of examples ranging from first plumage to that of the almost adult. None are in full plumage.

7. MEROPS BICOLOR (36).

[Valencia, ♂, ♀, August.]
In a series of five examples, one is in perfect plumage, the remaining four represent different stages of immaturity.

8. EURYSTOMUS ORIENTALIS (37).

[Dumaguete, ♀, August.]

9. ENTOMOBIA GULARIS (44).

[Valencia, ♂, August. Dumaguete, ♀, August.]

10. SAUROPATIS CHLORIS (47).

[Valencia, ♀, August. Dumaguete, ♀, August.]

11. XANTHOLÆMA ROSEA (51).

[Valencia, ♂, August.]

12. COLLOCALIA FRANCICA.

Hirundo francica, Gm. S. N. i. p. 1017; Walden, Ibis, 1874, p. 132. no. 70.

[Valencia, ♂, ♀, August.]
Mr. Everett's researches enable me to make known the existence in the Philippines of a second species of *Collocalia*. He has sent five examples. Underneath they are mouse-grey; above fuliginous brown, faintly tinged with bottle-green. The wings and tail darker brown than the back, showing a greenish gloss on the new feathers.

I can find no character whereby to separate these Negros individuals from those inhabiting Malacca, the Andamans, Sikim, Ceylon, the Neilgherries, the Mauritius, and the Fiji Islands. Wing 4·50. Formerly (*l. c.*) I referred by implication *C. troglodytes* to the *C. francica* section of the genus; but a reexamination of a considerable series of *C. troglodytes* shows that it more properly belongs to the section of which true *C. esculenta* may be taken as being the type.

13. Centrococcyx viridis (64).

[Valencia, ♂, August. Dumaguete, ♂, August.]

14. Penelopides panini (68)?

[Valencia, ♀, August: iris dull chestnut-brown; orbital and other bare skin white faintly tinged bluish; bill brown with olive-green tinge; feet dark lead-grey with a faint greenish cast; nails black.]

The single example sent wears the dress of the mature female of *P. panini*; but the bill is smooth, without lateral plates, grooves, or casque. The upper tail-coverts are ferruginous and not black. It may belong to a distinct representative form.

15. Artamus leucorynus (73).

[Dumaguete, ♂, ♀, August.]

16. Graucalus striatus (74).

[Dumaguete, ♂, August. Iris crimson. Valencia, ♀, August. Iris crimson; bill black; legs grey-black.]

Of four examples three (♂) have the throat and upper breast uniform slate-colour, the remainder of the lower plumage, the uropygium and upper tail-coverts being broadly banded with black and white. One example (marked ♀) differs by having the entire lower plumage banded with black and white.

17. Volvocivora? cærulescens (75)?

[Valencia, ♂, August: iris dark chocolate; bill black; legs blackish grey.]

A single example of a bird (marked ♂) which I provisionally refer to the above species is sent from Negros by Mr. Everett. It differs from every example in my series ex Luzon and Zebu in having a longer and larger bill, in being dark ashy grey above, without any dark brown almost black margins to the feathers, the uropygium and upper tail-coverts being of still paler grey, in being below pale grey and not dark iron-grey, in having the major wing-coverts pure white and the tertiary quills broadly margined with pure white, and in having the two outer pairs of rectrices broadly tipped with white and some of the other rectrices slightly white-tipped. The under tail-coverts are also almost pure white. The general dimensions are about equal in all. The adult males of *V. cærulescens* are jet black; the adult females are dark plumbeous grey (conf. P. Z. S. 1877, p. 759. no. 23), while this bird is pale-coloured. *V. cærulescens* is as

yet only known to inhabit Luzon and Zebu; and this may possibly belong to a representative form. But as it may also be *V. cærulescens* in first plumage, I refrain from bestowing on it a distinct title.

18. LALAGE DOMINICA (76).

[Valencia and Dumaguete, ♂, ♀, August.]

19. DICRURUS MIRABILIS (81).

[Valencia, ♂, ♀, August.]

20. PHILENTOMA ALBIVENTRIS.

Philentoma albiventris, Sharpe, Tr. L. S. 2nd series, Zool. i. p. 325. no. 49, "Guimaras" (Nov. 16, 1876).

[Valencia, ♂, August.]

A single example is sent by Mr. Everett; and it seems to belong to a species distinct from *P. cyaniceps*, and Mr. Sharpe appears to have been justified in separating it, notwithstanding the doubt he expresses (*l. c.*). Besides the lower breast and abdomen being pure white, the dimensions of the rectrices and wings, when compared with those of an adult Luzon male, are longer; tail 4·12 as against 3·50; wing 3·25 as against 2·87. These, however, are larger dimensions than those given by Mr. Sharpe of his type.

21. LEUCOCERCA NIGRITORQUIS (83).

[Valencia, ♂, August. Dumaguete, ♀, August.]

22. CYORNIS PHILIPPINENSIS.

Cyornis philippinensis, Sharpe, Tr. L. S. 2nd series, Zool. i. p. 325.

[Valencia, ♂ (juv.), August: iris dark brown; bill black; legs bluish grey. Dumaguete, August.]

The young birds (of which a series of five are sent) have their plumage, with the exception of the remiges and rectrices, which are brown, washed with blue or greenish blue, marked with large pale rufous spots. In one the whole of the body-plumage is so marked; in another the abdomen and throat are white; in another several of the uniform blue dorsal feathers have come in, and the breast is turning to pure rufous. The throat-plumes are the last to change to the adult colouring, while full maturity is indicated by the intensity of the rufous on the throat and breast.

23. HYPOTHYMIS AZUREA (85).

[Valencia, ♂ (not adult), August: iris dark brown; bill black; legs dark grey. Dumaguete, ♂, August.]

24. BUTALIS LATIROSTRIS.

Muscicapa latirostris, Raffles, Tr. L. S. xiii. p. 312; Walden, Ibis, 1873, p. 308.

[Valencia, ♀, August.]

A single example in first plumage, with pale rufous spots on the

sides of the neck and margins to the secondary and tertiary quills and major coverts; wing 2·56.

25. Broderipus acrorhynchus (90).

[Valencia, ♀ (juv.), August: bill dark sepia-brown. Dumaguete, ♂ (juv.), August: bill dark vandyke-brown.]

Judging by the series Mr. Everett sends (seven) and other examples of the Negros Oriole I have examined, it would appear that the extent of the yellow on the forehead is more restricted in the Negros and Guimaras forms than in examples from any of the other Philippine islands.

26. Megalurus ruficeps.

Megalurus ruficeps, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx.; P. Z. S. 1877, p. 94.

[Valencia, ♀, August: iris light clay-brown.]

Males from the same locality are of equal dimensions. New to Negros.

27. Dasycrotapha speciosa.

Dasycrotapha speciosa, Tweeddale, P. Z. S. 1878, pl. ix. p. 114.

[Valencia, ♂, August: iris crimson; bill orange-yellow.]

28. Ixus goiavier (99).

[Valencia and Dumaguete, ♂ and ♀, August.]

A series of five, with ear-coverts and sides of head brown.

29. Hyspipetes philippinensis (102).

[Valencia and Dumaguete, ♀, August.]

30. Copsychus mindanensis (105).

[Valencia, ♂ and ♀, August. Dumaguete, ♀, August.]

31. Cisticola, sp. ?

[Valencia, ♂, August: iris light grey-brown; bill brown; legs pale tinged with brown.]

Mr. Everett's note, above quoted, refers to a single example of the genus *Cisticola* which I am unable to determine. The example is in perfect plumage and belongs evidently to an adult; but the great variations in plumage the members of the genus exhibit make it possible that it belongs to some described species; and I refrain from bestowing what may be a useless title. Its dimensions are smaller than those of any species known to me. Wing 1·62, culmen 0·31, tarsus 0·62. The first primary is relatively long and broad, 0·53. Underneath the general colouring yellow-white, with a rufous tinge on the breast; flanks, under tail-coverts, wing-lining, and thigh-coverts pale ferruginous. Above the colouring is pale ferruginous-brown, each feather dark centred with brown; the nape is uniform pale ferruginous-brown, the upper tail-coverts being brighter ferruginous; the quills are brown margined with the

same pale ferruginous as the upper plumage. Rectrices above pale brown, underneath much paler, with bold subterminal dark brown almost black spots, which show through on the upper surface as brown marks; the inner margins of the quills are pale ferruginous.

This Negros bird differs from N.-Mindanao, Celebes, and Bangkok (Siam) examples of *C. grayi* in its smaller dimensions and longer and broader first primary, and in the absence of the pure uniform rufo-fulvous cap.

The description of *C. semirufa*, Cab., is too meagre for identification, and no dimensions are stated; but it is probably the same bird as *C. grayi*. *C. ruficeps*, Gould (Sclater, P. Z. S. 1877, p. 98), belongs to *C. grayi*, the only difference Dr. Brown's example exhibits being the absence of the rufous tinting of the breast and under surface generally.

32. ORTHOTOMUS CASTANEICEPS (113).

[Valencia, ♂ and ♀, August.]

New to Negros and not separable from the type, which inhabits the island of Guimaras.

33. CORYDALLA LUGUBRIS (117).

[Dumaguete, ♂ and ♀, August.]

34. PARUS ELEGANS (118).

[Valencia, ♂ and ♀, August.]

New to Negros.

35. ZOSTEROPS NIGRORUM, n. sp.

[Valencia, ♂ and ♀, August.]

Male and female. Above light olive-green; whole under plumage light greenish-yellow, almost pure yellow; closed wing like the back, outer quill-margins paler; space before the eye almost pure yellow; axillaries and under wing-coverts very pale yellow; a narrow black mark margins the white feathers of the underside of the orbit; rectrices pale brown edged with olive-green. Wing 2·18, tail 1·87, tarsus 0·62, culmen 0·44.

Closely allied to *Z. austeni*, Walden, ex Karen-nee, this Negros species differs in being of a darker shade of green above and a lighter yellow underneath.

36. DICÆUM HÆMATOSTICTUM.

Dicæum hæmatostictum (Sharpe, 'Nature,' August 1876, p. 297; Tr. L. S. ser. 2, Zool. i. p. 339).

[Valencia, ♂, August.]

37. NECTAROPHILA SPERATA (122).

[Valencia, ♂ and ♀, August.]

38. ARACHNECTHTHRA JUGULARIS (123).

[Valencia, ♂ and ♀, August.]

39. ÆTHOPYGA MAGNIFICA.

Æthopyga pacifica (Sharpe, 'Nature,' August 1876, p. 297; Tr. L. S. ser. 2. Zool. i. p. 342; Shelley, Monogr. *Cinnyridæ*, pt. 3, pl.

[Valencia, ♂ and ♀, August.]

In one example (♂) the uropygium is deep orange and not yellow.

40. ANTHOTHREPTUS CHLOROGASTER.

Anthreptes chlorogaster (Sharpe, Tr. L. S. ser. 2, Zool. i. p. 342. no. 107, "Negros," (1876).

[Valencia, ♀, August: iris indian-red.]

41. CORVUS PHILIPPINUS (125).

[Dumaguete, ♂, ♀, August.]

The disproportion between the dimensions of sexes in the Philippine Crow exhibits itself in the Negros examples sent by Mr. Everett, the wing of the male measuring 12 inches, as against 11 in the female; culmen of male 2·37, of female 2.12.

42. CALORNIS PANAYENSIS (128).

[Dumaguete, ♂, ♀, August.]

43. SARCOPS CALVUS (129).

[Dumaguete, ♂, ♀, August.]

44. MUNIA JAGORI (132).

[Valencia, ♂, ♀, August. Dumaguete, ♂, ♀, "breeding," August.]

May not Meyen's *Fringilla minuta* (Walden 133) be *M. jagori* in first plumage, before the black feathers come in? Otherwise it is remarkable that a species stated by Meyen to occur in numberless troops in the Luzon sugar-plantations has not, since he wrote (1834), been recognized.

45. OSMOTRERON AXILLARIS (136).

[Valencia, ♂, August. Dumaguete, ♀, August.]

46. LEUCOTRERON GIRONIERI (137)?

[Valencia, ♂, August.]

A single example of a Pigeon much resembling *L. gironieri*, ex Luzon and Guimaras, and probably representing an immature stage of its dress, is sent by Mr. Everett. It differs from all the phases of plumage described by me (*l. c.*) in having the throat, breast, and abdomen pale ashy white, much stained pale verdigris green. The crown and nape rich green like the back. A purple pectoral band is indicated by a few isolated plumes. The first primary is not abruptly attenuated; but perhaps the attenuated first quill is only produced later. The species has not heretofore been recorded from Negros.

47. Carpophaga ænea (141).

[Dumaguete, ♂, ♀, August.

48. Ianthœnas griseigularis (145).

[Valencia, ♂, August: iris orange; orbital region and basal half of bill dark crimson; apical half of bill pale yellow; feet dull carmine; nails yellowish grey.]

49. Macropygia eurycerca, sp. n. (146, *partim*).

[Valencia, ♂, August: iris yellow, with outer ring crimson; orbital region and base of bill crimson; bill light brown; feet carmine.]

Mr. Everett sends a single example, which agrees in every respect with the example obtained in Negros by Dr. B. Meyer, and described by me (Tr. Z. S. ix. p. 218. no. 146) when writing on *M. tenuirostris*. A recomparison made with Luzon examples leaves no doubt that the Negros bird is specifically distinct.

50. Turtur dussumieri (147).

[Valencia, ♂, August. Dumaguete, ♂, August.]

51. Chalcophaps indica (150).

[Valencia, ♂, August.]

52. Eudromias geoffroyi (161).

[Dumaguete, ♀, August: bill black; legs very pale greenish grey; feet darker grey.]

53. Rallina euryzonoides.

Gallinulæ euryzonoides, Lafresn. Rev. Zool. 1845, p. 368; Tweeddale, P. Z. S. 1877, p. 767.

[Valencia, ♂, August.]

New to Negros. The Luzon (Manilla) bird (Tr. Z. S. ix. p. 231. no. 175) has to be compared; for it is doubtful whether it does not rather belong to this species than to *R. fasciata*.

54. Hypotænidia torquata (177).

[Valencia, ♀, August.]

New to Negros.

55. Limosa ægocephala.

Scolopax ægocephala, Linn. S. N. i. p. 246. no. 16.

[Valencia, August.]

56. Nycticorax manillensis (198).

[Dumaguete, ♂, August: iris golden yellow; bill black, the base, greater part of lower half, and bare orbital skin bright yellow-green; legs and feet light yellow-green, clouded with olive-green in front, and on the upper surface of toes.]

In first plumage.

March 5, 1878.

Prof. Newton, F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1878:—

The total number of registered additions to the Society's Menagerie during the month of February was 63, of which 27 were acquired by presentation, 17 by purchase, 4 by exchange, 6 were bred in the Gardens, and 9 were received on deposit. The total number of departures during the same period, by death and removals, was 93.

The most noticeable additions during the month of February were

A pair of Leopards (*Felis leopardus*), obtained from Capt. Phillips, of the S.S. 'Mesopotamia,' February 18th. These Leopards, which were brought from the Persian Gulf by Capt. Phillips on his last voyage, are remarkable for their long hairy coats, bushy tails, and pale body-colour, which reminds one rather of the Ounce (*Felis uncia*). They are probably from some part of the mountainous district of Persia.

Mr. Sclater exhibited a second collection of birds from Duke-of-York Island, New Britain, and New Ireland, which he had received from the Rev. G. Brown, C.M.Z.S. These were mostly duplicates of the collection brought before the Society on the 19th of February last year[1], and consisted of examples of the following species:—

1. *Rhipidura setosa.*
2. *Monarcha alecto.*
3. *Dicranostreptus megarhynchus.*
4. *Nectarinia aspasia.*
5. —— *frenata.*
6. *Philemon cockerelli.*
7. *Calornis nitida.*
8. *Gracula kreffti.*
9. *Corvus orru.*
10. *Dendrochelidon mystacea.*
11. *Halcyon sanctus.*
12. *Centropus ateralbus.*
13. *Eclectus polychlorus.*
14. *Nasiterna pusio.*
15. *Lorius hypœnochrous.*
16. *Carpophaga rubricera.*
17. —— *van-wycki.*
18. *Œdirhinus insolitus.*
19. *Chalcophaps stephani.*
20. *Calœnas nicobarica.*
21. *Megapodius eremita.*
22. *Tringoides hypoleucos.*
23. *Tringa acuminata.*

Mr. Sclater called special attention to the following specimens, and read the subjoined notes on them:—

6. PHILEMON COCKERELLI (*l. c.* p. 104).

Two additional examples of this *Philemon*, both from New Britain, are in the collection. The species is exactly of the same form as *P. plumigenis* (*Tropidorhynchus plumigenys*, G. R. Gray, P. Z. S.

[1] See P. Z. S. 1877, p. 96; also Mr. Ramsay's notes on the same collection, Proc. Linn. Soc. New S. Wales, vol. i. p. 369.

1858, p. 174) of the Ké Islands, but is a larger and stronger bird, darker on the head, and paler on the throat and belly.

10. Dendrochelidon mystacea (*l. c.* p. 105).

Five skins from Duke-of-York Island.

12. Centropus ateralbus (*l. c.* p. 106).

Three examples of this Coucal from New Britain. In one the head is black, and back of the neck partly so; in the second the neck is white; and in the third the head is also white,—showing that, as I suggested (*l. s. c.*), there is much variation in colour in this species.

13. Eclectus polychlorus (*l. c.* p. 106).

Of twenty skins of this species, mostly labelled "Duke-of-York Island," but without indication of sex, fifteen are males (green) and five females (red).

18. Œdirhinus insolitus (*l. c.* p. 110).

Of this singular Fruit-pigeon, until lately supposed to be so excessively rare, there are no less than nineteen skins from Duke-of-York Island. The sexes are not marked; but there is no variation in their plumage; so we may consider them identical in this respect. Some of the specimens have the frontal knob much more developed, and are probably males.

In Part viii. of his 'Ornithological Miscellany' (pl. lxvi.) Mr. Rowley has given us an excellent figure of this species.

21. Megapodius eremita, Hartlaub, P. Z. S. 1867, p. 830.

Count T. Salvadori informs me that he has satisfied himself that *Megapodius hueskeri* of Cabanis and Reichenow, as I had called this bird, *l. s. c.*, is identical with the species previously described by Hartlaub under the name above given. He further assures me that my *Megapodius rubrifrons* from the Admiralty Islands (P. Z. S. 1877, p. 556) is undistinguishable.

23. Tringa acuminata, Horsf.

One skin of this species, which was not represented in the first series, from New Ireland.

Mr Sclater took this opportunity of exhibiting the specimen recorded by him (P. Z. S. 1869, p. 123) as *Athene variegata*, and subsequently described and figured by Mr. Sharpe (P. Z. S. 1876, p. 673, pl. lxii.) as *Ninox solomonis*. Mr. Sclater had compared this specimen with the type of *Noctua variegata* of Quoy and Gaimard, and had ascertained that his identification was correct, and that there was therefore no need of Mr. Sharpe's new name for the specimen.

Mr. Sclater exhibited a stuffed Coot belonging to the Museum of Science and Art at Edinburgh and believed to be the typical specimen of *Fulica gallinuloides* of King (Zool. Journ. iv. p. 96), and showed that it was really an example of *Fulica leucoptera*, Vieillot, and not of *Fulica armillata*, as he and Mr. Salvin (P. Z. S. 1868, p. 465 et Ex. Orn. p. 115), misled by Capt. King's imperfect description, had supposed.

Professor Newton, M.A., F.R.S., V.P.Z.S., exhibited a stone sent him by Mr. Caldwell, C.M.Z.S., and remarked:—

"The veracity of the earliest writer who treated at any length of the Solitaire (*Pezophaps solitaria*) affords a pleasing contrast with that of the latest. Many of the statements put forth by Leguat concerning that bird have already been curiously confirmed; and I have much pleasure in laying before the Society what appears to be another proof of his accuracy. Writing of the hen Solitaires he says:—

"'On leur trouve toûjours dans le gésier (aussi bien qu'aux mâles) une pierre brune de la grosseur d'un Oeuf de poule; elle est un peu raboteuse, platte d'un côté & arrondie de l'autre, fort pesante, & fort dure. Nous avons jugé que cette pierre naît avec eux; parce que quelque jeunes qu'ils soient, ils en ont toûjours, & n'en ont jamais qu'une; & qu'outre cela, le canal qui va du jabot au gésier, est trop étroit de moitié pour donner passage à une pareille masse. Nous nous en servions préférablement à aucune autre pierre, pour aiguiser nos couteaux'[1].

"When Mr. H. H. Slater was appointed by the Royal Society Naturalist to the Transit-of-Venus Expedition in Rodriguez, I especially drew his attention to this statement; but I have understood from him that, notwithstanding his careful examination of the caves of that island, he never found any thing bearing out Leguat's assertion. Shortly after his return, our Corresponding Member, Mr. Caldwell, of Mauritius, visited Rodriguez, as the Society is already aware (Proc. Zool. Soc. 1875, pp. 644–647). He was, as he has told us, more fortunate, and obtained three or four of what he believes to be the stones mentioned by Leguat. One of these he has been so good as to give to my brother, Mr. Edward Newton; and on behalf of both those gentlemen I now exhibit it. You will see that in most respects it agrees closely with the description of Leguat. It is brown, somewhat rough, heavy and hard. It is hardly, however, flattened on one side; and in connexion with that fact I may remark that the bird with whose remains it was associated appears to have been young. Its mineralogical nature has yet to be determined; but before it is cut up for that purpose I thought the Members of the Society would like to see it. Its weight is a little over $1\frac{3}{4}$ oz.

"Mr. Caldwell has also been so kind as to furnish me with some remarks on this and the other specimens he obtained; but his state-

[1] Voyages et Avantures de François Leguat &c. Londres: MDCCVIII. vol. i p. 100.

ments respecting them will possibly be more advantageously published as an appendix to the account of this bird which, as most (though apparently not every one) of our Members are aware, was drawn up more than twelve months ago, at the request of the Royal Society, by Mr. J. W. Clark and Mr. Edward Newton."

Mr. T. J. Parker exhibited and made remarks upon the stridulating organ of the Common Rock-Lobster (*Palinurus vulgaris*). He stated that the apparatus in question was produced by a peculiar modification of the antennulary sternum and of the basicerite or second joint of the antenna. The antennulary sternum forms a projecting vertical keel, with a rounded anterior border, and slightly convex sides; the anterior border is grooved in the middle line, the groove being bounded on each side by a strong smooth ridge; each lateral surface is marked with a shallow groove; and between this groove and the border, to which it is parallel, the surface is so smooth as to have the texture of polished ivory. The basicerite is uncalcified along a slit-like space on its inner surface; this space is filled up with a thick chitinous membrane, which is produced superiorly into a large flap, projecting outwards from the surface of the joint. Immediately beneath this flap the chitin becomes thickened, takes on the form of an oval area or pad, about $\frac{1}{3}$ inch long by $\frac{1}{4}$ inch wide, and marked by a number of fine parallel ridges. In relation with the inferior edge of this pad is a small calcified tubercle. When the antenna is in place, the flap works over the ridge on the corresponding side of the anterior border of the antennulary sternum, the tubercle fits into the groove on its lateral surface, and the ridged pad is closely applied to the smooth space between the groove and the border. Under these circumstances, when the antenna is moved upwards the friction of the pad against the smooth surface produces a loud grating noise, the principle being similar to that of the sound produced by the friction of india-rubber against paper. The apparatus can at any time be thrown out of gear, and the antenna moved noiselessly, by slightly abducting the latter. In November last, Mr. Saville Kent remarked in 'Nature' upon the "shrill squeaking sound" emitted by living specimens of *Palinurus* when handled, this sound being due, according to Mr. Kent, to the friction of the abdominal somites; and Mr. Parker suggested that the noise referred to may possibly have been produced by the apparatus described. He stated further that the apparatus was possessed by both sexes, although in the two specimens examined the noise produced was far louder in the male; and he also remarked upon the fact that, notwithstanding the great perfection of the stridulating organ, the auditory organ of *Palinurus* is in a very imperfect condition.

The following papers were read:—



1



2



3



4



5

W.Purkiss lith. Hanhart imp.

NEW SPECIES OF PLUSIOTIS

1. Notes on some Coleoptera of the Genus *Plusiotis*, with Descriptions of three new Species from Mexico and Central America. By A. Boucard, C.M.Z.S.

[Received February 4, 1878.]

(Plate XVI.)

I have again the pleasure to exhibit to the Fellows of this Society a fine series of Beetles of the genus *Plusiotis*, which I have acquired since I wrote my former paper on these Insects in the 'Proceedings' [1].

Amongst them are four new species totally distinct from all others. Three of these have been liberally given to me by my friends MM. Sallé, Baden, and Rodriguez. The fourth I discovered during my last voyage in Costa Rica. This increases the number of species known of these fine insects to twenty, of twelve of which the types are in my collection.

During my recent journey in Costa Rica, I have also been able to procure one more specimen of *Plusiotis batesii*, which agrees completely with the type, and one specimen of *Plusiotis chrysargyrea*, Sallé, varying from the original types of the species, not being quite of the same colour.

These insects are excessively rare, and appear to confine themselves to the forests, at a very high altitude.

I was in Costa Rica in the proper season, and at the exact locality where these insects are found; but I was not able to get more than three specimens, although I offered a high price for them to the natives, and did myself all that possibly could be done; I made several excursions on purpose, but with no result.

Every one in the country knew what I meant when I asked for golden and silvery beetles; but they did not procure me any.

Plusiotis batesii.

Plusiotis batesii, Boucard, P. Z. S. 1875, p. 119, pl. xxiii.

Hab. Volcano of Irazu, Costa Rica.

One specimen of this fine species, found in May near Potrero Cerrado, at the altitude of 8000 feet, was alive, but had lost its abdomen and some of its legs. It had evidently just been caught by a bird and dropped, or had disengaged itself, after having lost its abdomen. The vitality of this insect is so great, that several hours after I had found my specimen it could still move part of its body and its remaining legs. Although I looked with the greatest care for this insect, I was not able to find any more specimens.

At the suggestion of my friend Sallé, who thought that they ought to be found abundantly on Mimosa trees, like *Pelidnota*, I searched for them during many days on these plants, but without success, and those which I secured were found in the oak-tree region. I saw another specimen, which I consider to be a very fine variety of this

[1] See P. Z. S. 1875, p. 117.

species, in a small collection of insects made by Mr. Rogers. It is of the most splendid brass-colour; it was found near Rancho redondo, on the Volcano of Irazu, by an Englishman who was in the company, Mr. Rogers.

This insect is now in the collection of Mr. Du Cane Godman.

PLUSIOTIS CHRYSARGYREA.

Pelidnota chrysargyrea, Sallé, Annales de la Soc. Ent. de France, tome iv. p. 362.

One specimen of this magnificent species, found in April in the Candelaria Mountains, at the altitude of 5000 feet, in the oak-tree region.

It is quite perfect, and was taken alive on a roble tree (*Tecoma pentaphylla*, Jacq.). Being somewhat different from the types of the species, I give a description of it:—

Oblongo-ovata; capite thoraceque aureo-pallidis, margine rubro; elytris aureis, tenuiter punctatis, punctis in striis regulariter dispositis; infra aurea, tibiis tarsisque cupreis, antennis fuscis.

Length 1 inch 1½ line. *Mus.* Boucard.

Head, thorax, and elytra very slightly punctured, of a pale burnished gold-colour with coppery-red reflections; the anterior margin of the head and the sides of the thorax of a coppery-red colour, which distinguishes this species from *P. batesi*; tibiæ and tarsi of the same colour, with blue claws; abdomen and pygidium of a brilliant golden colour; antennæ rufous.

Its place is near *P. batesi*, to which it is closely allied.

PLUSIOTIS LÆTA, Sturm, Cat. 1843, p. 341.

According to M. Auguste Sallé, of Paris, who possesses the type of *P. læta*, Sturm, this species must be abolished, as it was described from a bad specimen of *Plusiotis psittacina*, which is from Mexico.

This proves that I was right when I suggested in my former paper that the locality of Valparaiso for this species was probably wrong; as up to this date no species of *Plusiotis* has been found south of Columbia.

PLUSIOTIS BADENI, n. sp. (Plate XVI. fig. 2.)

Oblongo-parallela, valde convexa, supra viridi-argentea, capite cupreo-violaceo, medio viridi crebre punctulato; thorace subtiliter punctulato, margine cupreo-violaceo, scutello violaceo lævi; elytris tenuiter punctatis, punctis in striis profundis regulariter dispositis; infra viridi-argentea, femoribus viridibus, tibiis cupreo-violaceis, tarsis cupreo-aureis, antennis fuscis.

Length 7½ lines.

Head of a coppery purple colour with the centre green, thorax silvery green, with a broad margin of the same colour as the head, both slightly punctured; the scutellum is also of that same colour; elytra silvery green, slightly darker than the head and thorax, strongly punctured, the punctuation disposed in regular striæ; the

underside is of a paler green with silvery reflections; tibiæ coppery purple, and tarsi coppery metallic; antennæ rufous.

Hab. Mexico.

The female of this species is of the same size, but a little wider; the tarsi are less coppery; and the colour of the thorax, elytra, and pygidium is slightly paler.

This species must be placed between *P. gloriosa*, and *P. lacordairei*.

I have pleasure in naming this fine insect after my friend Doctor Baden, to whom I am indebted for the specimen now in my collection.

Types, museums Baden and Boucard.

PLUSIOTIS RODRIGUEZI, n. sp. (Plate XVI. fig. 1.)

Oblongo-convexa, supra viridi-aurea; capite thoraceque subtiliter punctulatis; elytris punctatis, punctis in striis regulariter dispositis, margine lato aureo splendido; infra pallide viridis, tibiis tarsisque aureis, antennis rufis.

Length 1 inch.

Head and thorax slightly punctured, the latter twice as long as it is broad, convex, with a reddish gold margin, elytra strongly punctured; the punctuation is disposed in regular striæ, convex, broader in the middle and rounded in the base with a magnificent gold margin all round; the underside is of a pale uniform green with silvery reflections; tibiæ and tarsi golden; antennæ rufous.

Hab. Guatemala.

I have only one specimen of this charming species, the only one which was collected in the neighbourhood of Guatemala City by my intimate friend Mr. Juan Rosé Rodriguez, to whom I have the pleasure of dedicating this fine insect. It was found by him in the forests of oak trees near the capital. Its place is between *P. costata* and *P. sallei*, Bouc.

Type, mus. Boucard.

PLUSIOTIS PRASINA, n. sp. (Plate XVI. fig. 5.)

Oblongo-ovata, supra viridi-prasina; capite fortiter punctulato, thorace subtiliter punctulato; elytris fortiter punctatis, punctis in striis irregularitus; infra viridis, tibiis tarsisque violaceo micantibus.

Length 1 inch 1 line.

Head and elytra of a dark metallic green, both strongly punctured; on the latter the punctuation is disposed in irregular striæ; they are oblong, a little broader in the middle, with a prominent, thick, and compressed margin on the sides, which is very conspicuous; thorax slightly punctured, of the same colour; the underside is metallic green; tibiæ metallic purple; tarsi of the same colour, with coppery reflections; claws nearly black; antennæ dark rufous.

Hab. Mexico.

Its place is between *P. auripes* and *P. sallei*.

I have only one specimen of this insect, which was given to me by my intimate friend M. Auguste Sallé.

Types, museums Boucard and Sallé.

PLUSIOTIS BOUCARDI, Sallé. (Plate XVI. fig. 3.)

Oblongo-parallela, valde convexa; capite thoraceque viridi-aureis, subtiliter punctatis, margine cupreo; elytris splendide viridi-aureis, fortiter punctatis; infra cupreo-rufa, tibiis tarsisque nigris, antennis fuscis.

Length 1 inch 2 lines.

Head, thorax, pygidium, and elytra of a magnificent metallic golden green, with red reflections, surrounded by a narrow coppery-red margin. The elytra are rugose and strongly punctured; the underside is of a coppery red; femora, tibiæ, and tarsi quite black in the anterior legs; in the middle and posterior pairs the femora are coppery red and the tibiæ and tarsi are black; antennæ nearly black.

Hab. Costa Rica.

I have only one specimen of this magnificent species, found in the mountains of Candelaria, in the forest of robles (oak trees) at the altitude of 5000 feet.

Its place is near *P. victorina*.

Type, museum Boucard.

I have seen all the species of this genus described in this and my previous paper, and am satisfied that they are good and distinct. I have examples of all of them in my collection, except *P. psittacina* and *P. gloriosa*.

EXPLANATION OF PLATE XVI.

Fig. 1. *Plusiotis rodriguezi*, p. 295.
2. *P. badeni*, p. 294.
3. *P. boucardi*, p. 296.
4. *P. nnizechii*, P. Z. S. 1875, p. 124.
5. *P. prasina*, p. 295.

2. On a small Collection of Lepidoptera obtained by the Rev. J. S. Whitmee at the Ellice Islands. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received Feb. 6, 1878.]

The little series of Lepidoptera obtained from the Ellice Islands by Mr. Whitmee, although it contains only five species of Butterflies and two of Moths, makes a valuable addition to our knowledge of the geographical distribution of the forms inhabiting the Australian region, since we have hitherto been quite ignorant of the insect-fauna of these islands.

Of the seven species, all of which are described, one is of special interest to me; I refer to *Euplœa distincta*, a form figured by Herrich-Schäffer, from an example taken in the Viti Islands, as a variety of *E. eleutho*. To this insect I gave a name in my "List of the Diurnal Lepidoptera of the South-Sea Islands" (P. Z. S. 1874, pp. 274–291), and was severely censured for so doing by Herr

Schmeltz, in a paper criticising my determinations of South-Pacific Butterflies. Herr Schmeltz considered *E. distincta* to be an individual variety, and regarded it as an injury to science to give it a name; it is therefore satisfactory to find that *E. distincta* is the common *Euplœa* of the Ellice Islands, and consequently may be regarded as a fixed local form, of equal importance with *E. helcita*, *E. angasii*, and others of the *E.-eleutho* group.

RHOPALOCERA.

Nymphalidæ.

Euplœa, Fabricius.

1. Euplœa eleutho.

Danais eleutho, Quoy & Gaimard, in Freycinet's Voy. pl. 83. fig. 2 (1815).

The fact that this species is so rare that Mr. Whitmee only brought home a single example seems to show that its time of appearance is not synchronous with that of *E. distincta*. It represents the opposite extreme of modification in the group to which it belongs, and therefore is not likely to be a variety, since forms more nearly approaching *E. distincta* in character are known to be locally constant.

2. Euplœa distincta.

Euplœa distincta, Butler, P. Z. S. 1874, p. 278.

A good series, in both sexes, was obtained by Mr. Whitmee.

Junonia, Hübner.

3. Junonia villida.

Papilio villida, Fabricius, Mant. Ins. p. 35. no. 366 (1787).

Resembles Australian examples, being less suffused with orange tawny than Samoan specimens.

Diadema, Boisduval.

4. Diadema nerina.

Papilio nerina, Fabricius, Syst. Ent. p. 509. no. 277 (1775).

The whole of the specimens are rather small, resembling those of Cape York.

5. Diadema otaheitæ.

Diadema auge, Cramer, var. *otaheitæ*, Felder, Verh. zool.-bot. Ges. Wien, xii. p. 492. no. 185 (1862).

This may possibly be a dwarfed race of the preceding species; it is the common form of Samoa, where the specimens run even smaller than in the Ellice Islands.

HETEROCERA.

Lithosiidæ.

Deiopeia, Stephens.

6. Deiopeia pulchella.

Tinea pulchella, Linnæus, Syst. Nat. I, ii. p. 884 (1766).

Larger than Australian specimens, and with the red dashes on the primaries broader and longer.

Ophiusidæ.

Achæa, Hübner.

7. Achæa melicerte.

Phalæna-Noctua melicerte, Drury, Ill. Ex. Ent. i. p. 46, pl. 23. fig. 1. (1770).

One worn example was obtained of this widely distributed moth.

3. Notes on the *Penæidæ* in the Collection of the British Museum, with Descriptions of some new Species. By Edward J. Miers, F.L.S., F.Z.S., Zoological Department, British Museum.

[Received February 12, 1878.]

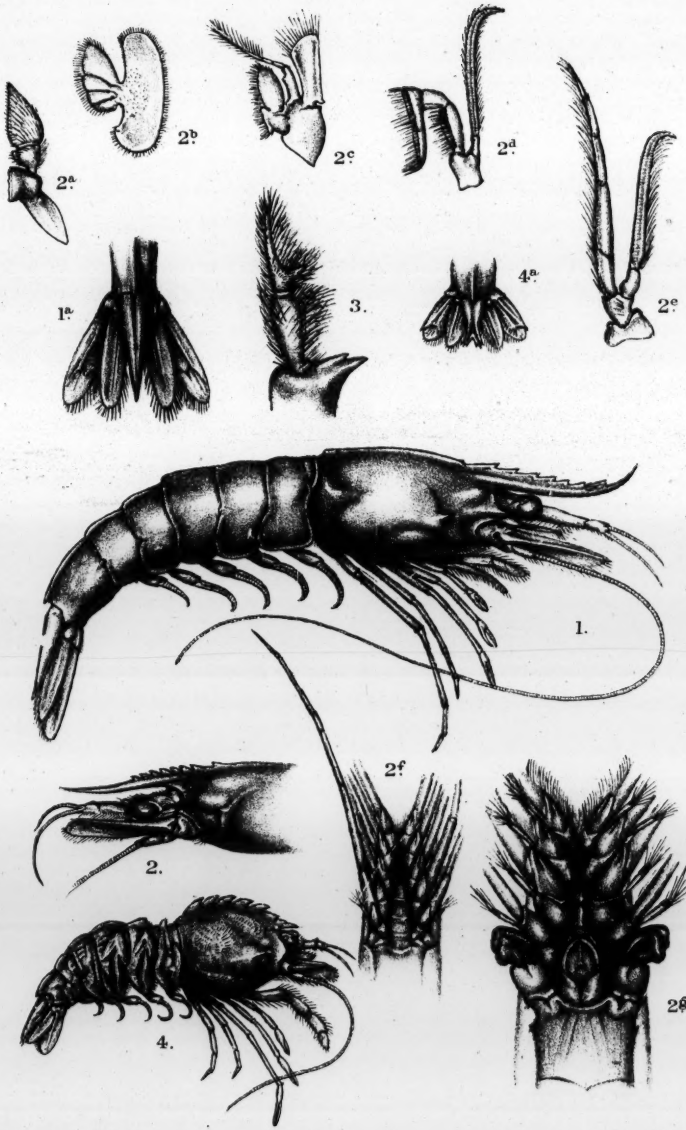
(Plate XVII.)

Mr. G. E. Dobson, M.B., F.L.S., lately presented to the Trustees of the British Museum a remarkable specimen of *Penæus*, with the request that I should lay a description of it before the Society. In studying the affinities of this form, which is described below under the name of *P. dobsoni*, I found it necessary to revise the characters of the whole of the species of this large and difficult genus; and although the materials existing in the national collection are not rich enough at present to permit of a complete review of the subject, it is hoped that the following notes on the species in the collection will contribute toward the elucidation of the genus, while the synoptical key to the genus appended will serve to indicate what appear to be the principal distinctive characters of the different species, and to mark what are *desiderata* in the collection of the British Museum. I have added some remarks upon the *Funchalia woodwardi*, and on the *Penæus edwardsianus* of Mr. J. Y. Johnson, showing that this latter species must be referred to the genus *Aristeus* of Duvernoy; also a description of a species of *Sicyonia* not hitherto recorded.

Penæus canaliculatus.

Palæmon canaliculatus, Olivier, Encycl. Méth. Hist. Nat. viii. p. 660 (1811).

Penæus canaliculatus, M.-Edw. Hist. Nat. Crust. ii. p. 414 (1837); De Haan, Faun. Japon. Crust. p. 190 (1849).



C. Berjeau del et lith.

Mintern Bros imp.

NEW SPECIES OF PENÆIDÆ.



Penæus marginatus, Randall, Journ. Ac. Nat. Sci. Phil. viii. p. 146 (1839).

? *Penæus plebejus*, Hess. Arch. f. Nat. p. 168, pl. vii. fig. 19 (1865).

The series in the British-Museum collection includes specimens from the Gulf of Suez, Shanghai, Yokohama (Japan), Torres Straits, Shark Bay, Houtmann's Abrolhos, Sir-C.-Hardy Island, and the Loyalty Islands (Lifu). In both sexes there is a single spine on the second joint of the first and second pairs of legs, and none on the third pair of legs. In the closely allied European *P. caramote* there is, besides these spines, a spine upon the first joint of each of the first three pairs of legs. The sixth postabdominal segment is not sulcate in either species; and in both the terminal segment is armed with lateral marginal spines.

PENÆUS BRASILIENSIS.

Penæus brasiliensis, Latr. Nouv. Dict. Hist. Nat. xxv. p. 256 (1817); M.-Edw. Hist. Nat. Crust. ii. p. 414 (1837); Stimpson, Ann. Lyc. Nat. Hist. New York, x. p. 132 (1871).

This species in external characters closely resembles the preceding, but differs in the following particulars:—There is a spine upon the second and third joints of the first pair of legs, one upon the second joint of the second pair of legs, and none upon the third pair of legs. The sixth postabdominal segment is grooved on either side of the longitudinal median carina on its upper surface. There are no spines on the lateral margins of the seventh postabdominal segment.

Specimens from Whydah on the west coast of Africa agree in all respects with authentic specimens from Brazil presented by the Paris Museum, and with specimens from the West Indies (Barbadoes) and North America, proving that this, like many other species, occurs on both sides of the Atlantic.

PENÆUS SEMISULCATUS.

Penæus semisulcatus, De Haan, Faun. Japon. Crust. p. 191, pl. xlvi. fig. 1 (1849).

A large series of specimens of both sexes is in the Museum collection, agreeing with De Haan's description and figure. It is probable that under the Fabrician name of *P. monodon* two closely allied but apparently distinct species were confounded by earlier authors. In *P. semisulcatus* the rostrum is 7–8-toothed above and 3-toothed below, the dorsal carina, which is faintly or obsoletely canaliculated, extends to the posterior margin of the carapace, and the gastrohepatic sulcus is faintly defined. There are examples from India (Pondicherry, Calcutta), Formosa, the Philippines, North Australia, and the Fiji Islands (Mbau), in the Museum collection.

In two specimens from Australia (Shark Bay), and one from Ceylon, the rostrum is 6–7-toothed above, the teeth toward the apex separated by much wider intervals than in the specimens referred to

P. semisulcatus, there is a short dorsal carina which does not reach to the posterior margin of the cephalothorax and is not canaliculated above, and the gastro-hepatic sulcus is very deep and strongly defined. For this latter form I propose to retain Fabricius's name of *P. monodon*, if the two species be distinct; as it would seem that the common Indian form must be designated by De Haan's name of *P. semisulcatus*, it having been first distinctly characterized by him, while it is impossible to ascertain from Fabricius's brief description which of the two species was known to that author.

The figure of *P. tahitensis* of Heller (Reise der Novara, Crust. p. 121, pl. xi. fig. 2, 1865) resembles this species; and in it the rostrum is represented as 3-toothed below; but it is described as edentate; so I cannot refer it with certainty to *P. semisulcatus*.

The *P. carinatus* of Dana (U.S. Expl. Exp. xiii., Crust. i. p. 602, pl. xl. fig. 2, 1852), from Singapore, is only briefly described, but appears to be identical with *P. semisulcatus*, with which it agrees in the form and number of the teeth on the rostrum. It is not, however, mentioned in the description whether the longitudinal carina on the cephalothorax is sulcate or not.

PENÆUS HARDWICKII, sp. n. (Plate XVII. fig. 1.)

The cephalothorax is very minutely granulated; the cervical suture is in its posterior half, and the cardiaco-branchial altogether, obsolete; a canaliculated dorsal crest extends from the base of the rostrum to the posterior margin. The rostrum reaches beyond the peduncles of the antennules, is 8–9-dentate above, the last tooth separated by twice the ordinary distance from the preceding; the inferior margin is entire; it is curved regularly upward toward the distal extremity, which is acute. There is a spine on the underside of the second joint of the first and second pairs of legs, and none on the third pair. The form of the sternum is as in the *P. curvirostris* of Stimpson; and the third to sixth postabdominal segments are carinate as in that species. The last postabdominal segment is deeply longitudinally sulcate above, and, as in *P. semisulcatus*, acute at apex, without lateral spines.

Hab. Indian Seas? (*Hardwicke*).

There are two specimens in the British-Museum collection, of which the exact locality is not known. This species is most nearly allied to *P. curvirostris*, Stimpson, from Simoda, Japan, but differs in having a canaliculated dorsal crest, and a longer rostrum, which is acute at the extremity; the sutures of the cephalothorax are also much less distinct. From the *P. semisulcatus* of De Haan, which resembles this species in having a single longitudinal dorsal sulcus, it differs in the form of the rostrum, which is edentate below, and in having only a single spine at the base of the first pair of legs,—and from the *P. sculptilis* of Heller, from Java, another unisulcate species, in the longer, more curved rostrum, and in the postabdomen being keeled only on the third to sixth segments, whereas in *P. sculptilis* all the postabdominal segments are said to be keeled.

PENÆUS INDICUS.

Penæus indicus, M.-Edw. Hist. Nat. Crust. ii. p. 415 (1837).

Penæus stylirostris, Stimpson, Ann. Lyc. N. H. N. York x. p. 134 (1871).

In specimens in the British-Museum collection from the Indian seas, Ceylon, and Chefoo, which I refer to this species, the first pair of legs are bispinose at base, the second pair unispinose, and the third pair unarmed; there are no lateral marginal spines on the last postabdominal segment. The rostrum in young specimens considerably projects beyond the antennal scale, and the median dorsal carina reaches nearly to the posterior margin of the cephalothorax; in adult specimens, however, the rostrum scarcely projects beyond the antennal scale, and the dorsal carina is nearly obliterated. In one specimen, fully adult, from Amoy, which is probably only a variety of this species, the rostrum is even shorter than the antennal scale, and $\frac{1}{3}$-dentate.

I cannot find any valid characters by which to distinguish from this species the *P. stylirostris*, Stimpson, of Panama, of which specimens, from that locality, are in the British-Museum collection.

PENÆUS MONOCEROS.

Penæus monoceros, Fabr. Ent. Syst. Suppl. p. 409 (1798); M.-Edw. Hist. Nat. Crust. ii. p. 415 (1837); De Haan, Faun. Japon. Crust. p. 192, pl. xlvi. fig. 2, *P. ensis* (1849); Dana, U.S. Expl. Exp., Crust. i. p. 605, pl. xl. fig. 5 (1852).

Specimens in the British-Museum collection from the Indian seas, Calcutta, Ceylon, and Penang, agree with M.-Edwards's short description, and possess the diagnostic characters indicated by De Haan, but differ from De Haan's longer description in having no lateral marginal spines on the terminal segment. De Haan's specimens belong perhaps to a distinct species, in which case the name of *P. ensis*, as they are designated in the plate, would be applicable to them.

PENÆUS MEMBRANACEUS.

Penæus membranaceus, Risso, Crust. des environs de Nice, p. 98 (1816); Hist. Nat. Eur. Mérid. v. p. 68 (1826); M.-Edw. (part.), Hist. Nat. Crust. ii. p. 417 (1834); Heller, Sitz. Akad. Wissensch. xlv. i. p. 423, pl. ii. fig. 49 (1862); Crust. südl. Europa, p. 296, pl. x. fig. 11 (1863).

Penæus longirostris, Lucas, Explor. Sci. Algérie Crust. p. 46, pl. iv. fig. 6 (1849).

Penæus bocagei, Johnson, Proc. Zool. Soc. p. 255 (1863), p. 900 (1867).

See Johnson's remarks (P. Z. S. 1867, p. 900) on the complicated synonymy of this species. If Dr. Heller's views are correct, Milne-Edwards attributes to *P. membranaceus* some of the characters of the *Solenocera siphonocera* (*Penæus siphonocerus*, Philippi), subsequently described by Lucas, Ann. Soc. Ent. France, viii. p. 219

(1850), under the name of *Solenocera philippii*. Besides *P. siphonocerus* the *Penæus distinctus* of De Haan (Faun. Japon. Crust. p. 194, 1849) evidently belongs to this genus, and must be designated *Solenocera distincta*. Of it I have seen no specimens.

Perhaps also the *Penæus crassicornis* of Milne-Edwards (Hist. Nat. Crust. ii. p. 418, 1837) from India should be referred here.

PENÆUS DOBSONI, sp. n. (Plate XVII. fig. 2.)

Cephalothorax smooth, not hairy or scabrous, with the cervical, gastro-frontal, and cardiaco-branchial sutures faintly indicated. Antennal and hepatic spines present, but no pterygostomian spine at the antero-inferior angle of the cephalothorax. Rostrum slender, not quite reaching to the apex of the antennal scale, 7–9-dentate above, about four of the teeth being posterior to the frontal margin, the posterior tooth separated by a greater interval than the others, which are equidistant from one another; there are no teeth on the anterior third of the upper margin, nor on the inferior margin; the apex, in the only specimen which appears perfect, is acute. Posteriorly the rostrum is prolonged into a short median dorsal crest, which terminates at some distance from the posterior margin. There are no longitudinal median dorsal *sulci*. The first five postabdominal segments are rounded at their postero-lateral angles; the posterior margins of the first, second, fourth, and fifth have a semicircular notch on each side of the body; there is a longitudinal median dorsal carina on the third to sixth segments, which is but faintly indicated on the third segment, and a faintly indicated lateral carina on each side of the fifth and sixth segments; the terminal segment is longitudinally sulcate above, the extremity very slender and acuminate, the lateral margins ciliated, but without mobile spines; the appendages of the sixth segment somewhat oblong-oval, and narrowed at the distal extremities.

The eyes are very large; the antennules with the joints of the peduncle flattened on their inferior surfaces, and with two flagella, of which the inner is nearly twice as long as the outer, but not as long as the cephalothorax. Antennæ with the flagella very long. The crowns of the mandibles are slightly concave on their inner surfaces, the cutting-edges thin, and with a tooth near the apex; the palpus tomentose and 2-articulate, the terminal joint foliate, triangular and acute. The second maxillipedes are densely hairy; the outer maxillipedes are very slender, almost styliform, and their exognathi reach almost to the extremity of the penultimate joint. The three anterior pairs of legs are small and very slender, successively slightly increasing in length, but the third pair not more robust than the preceding; they are very feebly didactyle, and the fingers are much shorter than the palmar portion of the hand; the fourth pair of legs are very feeble, and much shorter than the preceding; the fifth pair are obsolete, thickened, and two-jointed, the terminal joint constituting an indurated corneous lobe; there is also a small lobate prolongation at base of each of the fourth legs; and the lobe between the bases of fifth pair of legs (which resembles in form that usual

in the female of *Penæus*, but is not divided by a median fissure) is of the same corneous consistency. All the legs, except the fifth rudimentary pair, are furnished with an exopodite. There is a spine on the under surface of the second joint of the legs of the first three pairs, that on the third pair of legs very small.

Hab. Mangalur (Mangalore), west coast of India.

Collected by Dr. G. E. Dobson, to whom I have much pleasure in dedicating the species.

I have examined four specimens of this species, all of which are certainly females. One of these has been presented by Dr. Dobson to the trustees of the British Museum. The fact that no males have yet been observed renders it possible that the rudimentary and indurated condition of the fifth pair of legs may be peculiar to the female sex—an opinion shared both by Dr. Semper and Mr. Wood-Mason, who have seen the specimens; and as the mouth-appendages, although presenting some peculiarities, do not depart widely in structure from the type usual in *Penæus*, I think it advisable until more specimens shall have been examined, to retain the species in that genus. Should further researches, however, prove that the rudimentary condition of the fifth legs exists in both sexes, the name *Mangalura* may be adopted to designate the genus, which will be characterized not only by the above-mentioned character, but also by the triangular shape of the terminal joint of the mandibular palpus (which is less delicate and transparent in texture than is usual in *Penæus*), and the slender outer maxillipedes. The species will then stand as *Mangalura dobsoni*[1].

The form of the fifth pair of legs is not analogous with that characteristic of the very different genus *Sergestes*, wherein these members, although rudimentary, are very slender, and similar in structure to the preceding pairs.

In the form of the rostrum *P. dobsoni* resembles the *Penæus sculptilis* of Heller, from Java (Voy. Novara, Crust. p. 122, pl. xi. fig. 1); but, besides the characters derived from the fourth and fifth pairs of legs, which are of the normal form in *P. sculptilis*, that species differs, if the figure be correct, in the much longer flagella of the antennules, and in the absence of a notch in the posterior margin on the sides of the first and second postabdominal segments, in the form of the first postabdominal segment, which is rounded at its

[1] Since writing the above, Professor Wood-Mason has discovered, among specimens of *P. dobsoni* from the same locality (Mangalore), a single male individual, in which he observed that the fifth legs are fully developed, and which, by his kindness, I am now enabled to figure (see Pl. XVII. fig. 2, *f*). It is of very small size, not much more than half as large as the females described by me, which it in all respects resembles, except in the fifth legs. These are very slender and elongated, longer, in fact, than those of the preceding pair, with the dactylus much shorter than the preceding joint. The fact, therefore, that the rudimentary condition of the fifth legs is a sexual character peculiar to the female may be regarded as definitely established; nor does it seem that this can possibly be accidental, or due to the loss of the legs and subsequent induration of the joint, as the indurated terminal lobe is of the same shape on both legs in all four of the specimens seen by me, and I have never observed a similar condition of the joint in any other specimen of the genus.

antero-inferior angle, &c. The sex of the specimens of *P. sculptilis* is not stated.

In the *P. avirostris*, Dana (U.S. Expl. Exp. xiii. Crust. i. p. 603, pl. xi. fig. 3, 1852), from Singapore, which is but shortly characterized, the rostrum is somewhat of the same form, but straighter, shorter, and only 6-toothed above, the legs of the two posterior pairs much more slender than the preceding (sex not stated). The cephalothorax is not dorsally carinate in its posterior half.

PENÆUS AFFINIS.

Penæus affinis, M.-Edw. Hist. Nat. Crust. ii. p. 416 (1837); De Haan, Faun. Japon. Crust. p. 192, pl. xlvi. fig. 3, *P. barbatus* (1849).

Penæus velutinus, Dana, U.S. Expl. Exp. xiii. Crust. i. p. 604, pl. xl. fig. 4 (1852).

Whether this species be the *P. affinis* of Milne-Edwards must remain uncertain, as his type specimen has not been figured, and his short description leaves many particulars unnoticed; but it is certainly the one figured by De Haan under the name of *P. barbatus*, and referred by him in the text to *P. affinis*. *P. velutinus* of Dana (U.S. Expl. Exp. xiii. Crust. i. p. 604, pl. xl. fig. 4, 1852) from Lahaina, Sandwich Islands, seems to be also referable to the same species. His description applies to it; and although his figure, when compared with that of De Haan, presents some slight differences, they are probably due to inaccuracies of drawing. Examples of this species are in the British-Museum collection from Japan, Sandy Cape, Sharks' Bay, West Australia, and the Gulf of Suez; hence it would appear to have a wide geographical range.

P. constrictus, Stimpson (Ann. Lyc. Nat. Hist. New York, x. nos. 4, 5, p. 135, 1871), from the coast of Carolina, U. S., of which there is one specimen in the British-Museum collection, presented by the Smithsonian Institution, is nearly allied to the above. The teeth of the rostrum are stated to be equidistant by Stimpson; but in the specimen I have examined, the last tooth is (as in *P. affinis*) separated by a wider interval than the preceding. It differs, however, in being much less pubescent (the postabdomen is naked and glossy), and in having a very deep longitudinal median sulcus on the last segment; which is margined by lateral carinæ.

P. pubescens of the same author (*l. c.* p. 133), based upon a single female example with imperfect rostrum from St. Thomas, would also seem from the description to be closely allied to *P. affinis*, and, in the absence of specimens for comparison, I am unable to say how it may be separated from that species. It will probably prove to be distinct, on account of the widely distant locality; therefore I do not quote it as a synonym of the Indo-Pacific form.

PENÆUS STYLIFERUS.

Penæus styliferus, M.-Edw. Hist. Nat. Crust. ii. p. 418 (1837).

There is a single specimen, a male, in bad condition, which I refer

with some hesitation to this species, in the Museum collection. The rostrum is of the form described by Milne-Edwards, but reaches but little beyond the peduncle of the antennules, and scarcely at all beyond the antennal scale. The fifth pair of legs is considerably longer than the preceding, and very slender; the dactylus small, of the usual form. This species cannot be the male sex of *P. dobsoni*, described above, as it differs in the form of the postabdominal segment, which is rounded at its antero-lateral angle, in the existence of spines on the lateral margins of the last postabdominal segment, &c. The median dorsal carina is prolonged to the posterior margin of the cephalothorax; and there is a raised lateral line on each side, extending from a point immediately above the antennal spine halfway to the posterior margin.

If the genus *Xiphopeneus* of Smith (Trans. Conn. Ac. ii. p. 26, 1871) be sustained, it will probably be necessary to refer this species to it, as it agrees in the form of the rostrum, and in the length of the legs of the fifth pair, although the dactylus is quite short.

PENÆUS KRÖYERI.

Peneus kröyeri, Heller, Wien. Akad. Wissensch. Sitzungsb. xlv. (Abth. i.), p. 425, pl. ii. fig. 51 (1862).

Xiphopeneus harttii, Smith, Trans. Conn. Ac. ii. p. 28, pl. i. fig. 1 (1871).

I have little hesitation in referring the *Xiphopeneus harttii* of Smith, from Caravelhas, Bahia, to the previously described *P. kröyeri* of Heller, from Rio Janeiro. A comparison of the figures and descriptions will, I think, suffice to establish their identity; and there is a specimen from the West Indies in the British-Museum collection which appears to belong to the same species. The genus *Xiphopeneus* was characterized by its author mainly by the long and slender antennules (which have a small lamelliform appendage which is not foliaceous and expanded over the eye as in *Penæus*), the form of the cephalothoracic sulci, and the great length of the fourth and fifth thoracic legs (which have the terminal joints slender and flagelliform or, rather, styliform). The mouth-organs, antennæ, &c. are not different from those of *Penæus*.

It will be seen that these characters are not of greater value than those which distinguish the *Penæi* of Milne-Edwards's first and second sections (which have never been considered of generic importance). Moreover the length of the posterior legs is certainly a character that varies in the different species; and in one (*P. styliferus*) already referred to, which agrees in most of its characters with *Xiphopeneus*, the dactylus of the fifth pair of legs is quite short. Nor do we know at present how far these peculiarities are dependent upon the sex of the animals (the specimens of *P. kröyeri* and *P. styliferus* in the Museum collection are both males).

If the genus *Xiphopeneus* be retained as distinct, it will be necessary to constitute more than one other new generic division for species hitherto included in *Penæus*; and as the materials at present existing

in the British-Museum collection do not enable me to adopt this course, as many species are not as yet represented in it, I have, in the synopsis of the species given below, and until a more complete revision of the genus shall have become possible, included the species in *Penæus*.

Synoptic Table of the Species of Penæus.

The object of the following analytical Table is to indicate the principal external characters by which the species of *Penæus* may be distinguished. There are certain species which have not been described with sufficient detail to allow of their incorporation in the list; these are either previously referred to, or are mentioned by Milne-Edwards in the 'Histoire Naturelle des Crustacés.' The species of which there are no specimens in the British-Museum collection, and which are therefore unknown to me, are distinguished by an asterisk.

I. Antennules with both flagella extremely short. Two deep longitudinal sulci extending along the whole length of the cephalothorax, adjacent to the rostrum and the median carina, which is itself deeply sulcate. (A supraorbital spine present.)

First and second pairs of legs bispinose, third pair unispinose at base. Seventh postabdominal segment with lateral marginal spines.

1. *P. caramote*, Risso.

European.

First pair of legs bispinose, second pair unispinose, third pair unarmed at base. Terminal segment without lateral marginal spines.

2. *P. brasiliensis*, Latr.

Atlantic region.

First and second pair of legs unispinose, third pair unarmed at base. Terminal segment with lateral marginal spines.

3. *P. canaliculatus*, Oliv.

Indo-Pacific region.

II. Antennules longer. No lateral sulci on the cephalothorax, bordering the rostrum and median carina. (Supra-orbital spine usually absent.)

A. *Rostrum much longer than the eyes, reaching nearly to, or beyond, the end of the antennal scale.*

a. *Carapace with a ridge extending backward from the origin of the rostrum to, or nearly to, the posterior margin of the cephalothorax.*

§ *The carina between the base of rostrum and posterior margin sulcate, and reaching to the posterior margin.*

First pair of legs bispinose, second pair unispinose, third pair unarmed at base. Rostrum $\frac{7-8}{3}$-dentate, third to sixth postabdominal segments keeled.

4. *P. semisulcatus*, De Haan.

Japan, Indo-Pacific region.

First and second pairs of legs unispinose, third pair unarmed at base. Rostrum $\frac{8-9}{0}$ dentate, curved upward toward the apex; third to sixth postabdominal segments keeled.

5. *P. hardwickii*, Miers.

Indian Seas.

Rostrum $\frac{9}{0}$-dentate, slightly ascending toward the apex. All the postabdominal segments keeled.

*6. *P. sculptilis*, Heller.

Java.

§§ *The carina between the base of rostrum and posterior margin of the cephalothorax not sulcate, and often not reaching to the posterior margin.*

* *Rostrum with the inferior margin dentate.* (*No lateral spines on last postabdominal segment.*)

Rostrum $\frac{9-10}{1-2}$-dentate. Terminal segment ending in a long spine.

*7. *P. setiferus*, Linn.

West Indies, east coast of North America.

Rostrum $\frac{6-7}{3}$ dentate, not reaching beyond the antennal scale. Terminal segment acute.

8. *P. monodon*, Fabr.

Indian and Australian Seas.

Rostrum very slender and styliform in its distal half, $\frac{8-9}{4-5}$-dentate and reaching slightly beyond the antennal scale.

9. *P. indicus*, M.-Edw.

Indo-Malayan Seas; Panama?

** *Rostrum with the inferior margin entire.*

1. *Rostrum not reaching far beyond the end of the antennal scale.*

Rostrum ensiform, straight, 8–10-dentate above, the teeth extending along nearly the whole upper margin. Terminal postabdominal segment without lateral marginal spines.

10. *P. monoceros*, Fabr.

Indo-Malayan Seas.

Rostrum curved upward toward apex, 8-dentate above, dorsal carina reaching nearly to the posterior margin. Terminal segment as in *P. monoceros*.

*11. *P. curvirostris*, Stimpson.

Japan, Simoda.

Rostrum robust, curved slightly upward, 8–9-dentate above, the last tooth situated on the dorsal carina at considerable distance from the preceding. Terminal segment with a pair of lateral spines.

12. *P. membranaceus*, Risso.

Mediterranean, Madeira.

Rostrum styliform at apex, nearly straight, 7–9-dentate above in its proximal half. Terminal segment without lateral marginal spines; 5th legs (in the female) rudimentary.

13. *P. dobsoni*, Miers.

West Coast of India.

Rostrum slender, styliform and produced at apex, 6–9-dentate above at its base. Terminal segment with prominent lateral marginal spines; 5th legs (in the male) long and slender, dactylus small.

14. *P. styliferus*, Edw.

Bombay.

2. *Rostrum reaching far beyond the end of the antennal scale.*

Rostrum 9–10-dentate above; the 3–4 last teeth placed upon the slender styliform distal half. Last postabdominal segment with lateral spines.

*15. *P. foliaceus*, Risso.

Mediterranean.

Rostrum 6-dentate above, the styliform distal portion without teeth. Terminal segment without lateral spines.

16. *P. kröyeri*, Heller.

Brazil West Indies.

b. *Cephalothorax without any median dorsal ridge.* (*Rostrum entire below.*)

Rostrum straight, dentate nearly to its apex; first tooth separated by a

wider interval than the preceding. Cephalothorax and postabdomen tomentose. Terminal segment not carinate, with minute lateral spines.

17. *P. affinis*, Edw.

Indo-Pacific region.

Rostrum and cephalothorax as in *P. affinis*. Postabdomen naked. Terminal segment with the deep longitudinal median sulcus defined by lateral carinæ, and with lateral spinules.

18. *P. constrictus*, Stimpson.

East Coast United States.

Rostrum somewhat sinuated, 9-dentate above, with the teeth equidistant. Terminal segment without lateral spines.

*19. *P. tenuis*, Dana.

North Patagonia.

Rostrum styliform toward apex, nearly straight, 6-dentate above near its base; the last tooth separated by a wider interval. Terminal segment without lateral marginal spines.

*20. *P. avirostris*, Dana.

Singapore.

B. *Rostrum very short, not reaching beyond the eyes.*

* *Rostrum slender.*

Eye-peduncles long. Rostrum not half as long as the eyes, 7-dentate above.

*21. *P. podophthalmus*, Stimpson.

Hong Kong.

Eye-peduncles of moderate length. Rostrum a little shorter than the eyes, 5-dentate above.

*22. *P. gracilis*, Dana.

Sooloo Sea.

Eye-peduncles thick. Rostrum scarcely reaching beyond them, 8–9-dentate above. (5th? legs greatly elongated, with the dactylus nearly half as long as the cephalothorax.)

*23. *P. stenodactylus*, Stimpson.

Hong Kong.

** *Rostrum laminiform, high, and laterally compressed.*

Rostrum 9–10-dentate above. Flagella of the antennules half as long as the peduncle.

*24. *P. lamellatus*, De Haan.

Japan.

Rostrum 6-dentate above. Flagella of the antennules about as long as the peduncle.

* 25. *P. brevicornis*, M.-Edw.

Indian Seas.

ARISTEUS EDWARDSIANUS. (Plate XVII. fig. 3.)

Penæus edwardsianus, Johnson, P. Z. S. 1867, p. 897.

The typical example of this very fine species is in the collection of the British Museum; and I have little hesitation in referring it to the genus *Aristeus* of Duvernoy (Ann. Sci. Nat., sér. 2, Zool. xv. p. 101, 1841). The character principally relied upon by Duvernoy for the distinction of the genus was derived from the ramose structure of the branchiæ, which he conceived were formed upon a different type from that found in other genera of the Caridea; but I am able, from an examination of the branchiæ of *A. edwardsianus*, to confirm Dana's observation that they do not differ essentially in struc-

ture from those of the species of *Penæus*. There are, however, other points in which the genus *Aristeus* differs from *Penæus*, and which seem to warrant the retention of Duvernoy's generic name. The two flagella of the antennules are very unequal; one is extremely short, the other remarkably long, as long as the animal itself; the palpi of the mandibles are robust, not foliaceous and membranaceous, as in *Penæus*; the fifth pair of legs is very long and slender, not shorter than the preceding pair; the first pair of postabdominal appendages terminate in a single ramus, the second ramus being rudimentary or entirely absent. I may add that the anterior margin of the first postabdominal segment does not form an angle with the lateral margins, as usual in *Penæus*, but the antero-lateral angles are rounded.

Duvernoy established the genus upon specimens from Nice, which he referred, no doubt correctly, to the *Penæus antennatus* of Risso (Hist. Nat. Eur. Mérid. v. p. 68, 1826).

P. edwardsianus resembles in general appearance the figure of *P. antennatus* given by Duvernoy; but the carapace is marked with strong ridges upon the hepatic, pterygostomian, and branchial regions, the last postabdominal segment is not sulcate above, and the rami of the postabdominal appendages, especially of the first pair, are much longer. There are also some marked differences in the mouth-appendages which can scarcely be due to inaccurate drawing of the details of *Aristeus antennatus*; the palpus of the mandible in *A. edwardsianus* is much more robust than in the Mediterranean species, is densely hairy, and the third joint is bilobate; the exognath of the second pair of maxillipedes is very long, reaching beyond the end of the antennal scale, and more than twice the length of the endognath itself, while that of the third pair of maxillipedes is quite short.

The specimen is a female.

The genus *Xiphopeneus* of Smith (referred to above) resembles *Aristeus* in the form of the carapace and rostrum, and length of the posterior legs and postabdonimal appendages; but there does not exist the marked disparity in length in the flagella of the antennules, nor is it stated that the mandibular palpi and rami of the first pair of postabdominal appendages differ from those of the ordinary *Penæi*.

Funchalia woodwardi.

Funchalia woodwardi, Johnson, P. Z. S. 1867, p. 896.

The mouth-organs of the unique example of this remarkable form (which is in the British-Museum collection) have not been dissected; but the long, corneous, and somewhat sickle-shaped processes of the mandibles are plainly visible, and suffice to establish its generic distinctness; the "broad lamellar appendage" at each side of the mouth, referred to by Mr. Johnson, is evidently the foliaceous palpus of the mandible, the terminal joint of which is large and truncated at its distal extremity.

The specimen is a female.

SICYONIA FURCATA, sp. n. (Plate XVII. fig. 4.)

This species, in the form of the body, closely resembles *Sicyonia ocellata*, Stimpson (Proc. Ac. Nat. Sci. Phil. p. 43, 1860), of which young specimens from Hong Kong, presented by the Smithsonian Institution are in the British-Museum collection, and also one fully adult from Ceylon, presented by E. W. H. Holdsworth, Esq. As in *S. ocellata*, the dorsal carina is very convex and strongly dentate, the cephalothorax tomentose, and the first to sixth postabdominal segments deeply channelled and without spines on the lateral margins. The terminal segment, however, is of very different form, being furcate at the extremity, the lobes of the fork divergent, acute at apex and deeply channelled above, the inner and outer margins carinate and ending in small subterminal spines on each lobe of the fork. In *S. ocellata* the last postabdominal segment is simple and acute at apex.

Hab. Sooloo Islands.

A single adult example is in the collection. This specimen, and also those of *S. ocellata* that I have seen, appear to be of the female sex.

EXPLANATION OF PLATE XVII.

Fig. 1. *Penæus hardwickii* (p. 300), lateral view, natural size.
1 *a*. Terminal segment and uropoda of the same, natural size.
2. *Penæus dobsoni* (p. 302), lateral view of cephalothorax, natural size.
2 *a*. Mandible, magnified.
2 *b*. Second maxilla, magnified.
2 *c*. First maxillipede, magnified.
2 *d*. Second maxillipede, magnified.
2 *e*. Third maxillipede, magnified.
2 *f*. Part of the ventral surface of the cephalothorax of a male individual, showing the form and position of the fifth pair of legs (from a specimen lent by Prof. J. Wood-Mason, see note p. 303).
2 *g*. The same view of a female, showing the rudimentary and indurated condition of the fifth pair of legs.
3. Exognath of the mandible of *Aristeus edwardsianus* (p. 308), natural size.
4. *Sicyonia furcata* (p. 310), lateral view, natural size.
4 *a*. Terminal segment and uropoda of the same, magnified.

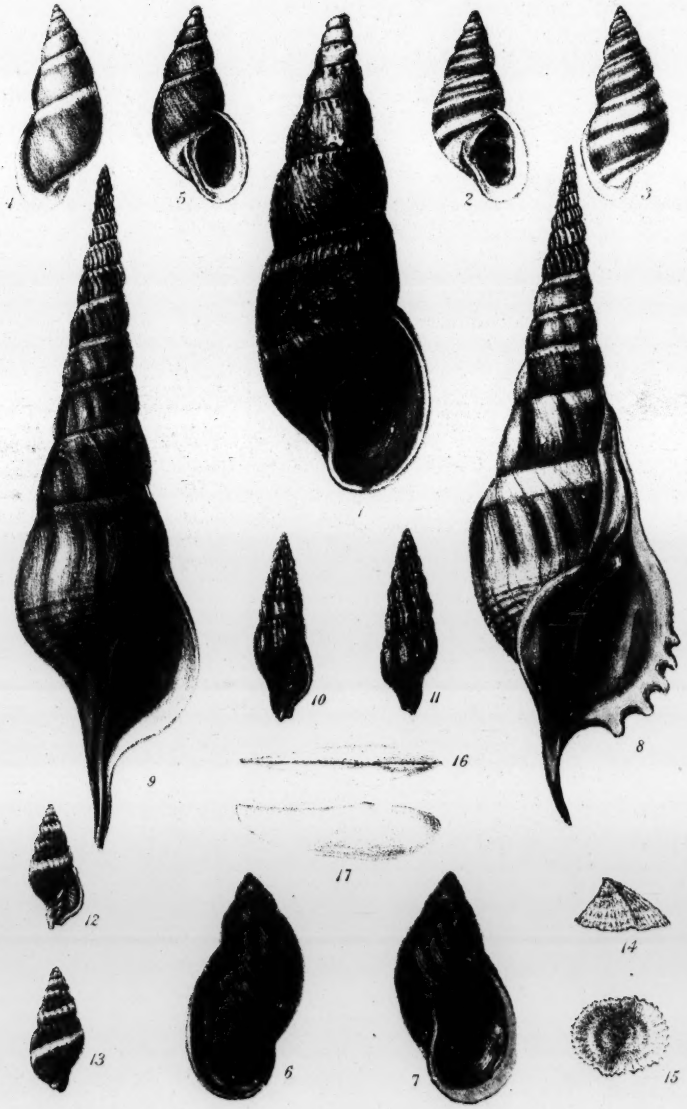
4. Description of a new Genus of Land Shells belonging to the Family Cyclophoridæ. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received Feb. 16, 1878.]

Genus MASCARIA, Angas.

Operculum horny, ovate, pointed above; whorls few; nucleus situated near the base of the columellar margin.

Shell rimate, elongately ovate, conically turreted, nearly smooth or faintly longitudinally striated; aperture ovate, rounded below and angulate above; peristome continuous, single; outer lip thickened and slightly expanded.



J. Smit imp. lith. Hanhart imp.

NEW SHELLS FROM KURRACHI, MADAGASCAR, ECUADOR & AUSTRALIA

I have established this genus for the reception of certain species of land shells that have hitherto been included in the genus *Megalomastoma* of Guilding, a natural West-Indian group, from which, however, they appear to me to differ so greatly in several important characters that I do not hesitate to separate them from the *Megalomastomata* as a distinct natural group, having its habitat in Madagascar and the Mascarene Islands.

The type of my genus *Mascaria* is the *Cyclostoma croceum* of Sowerby, which has been placed in the genus *Megalomastoma* by H. & A. Adams, Pfeiffer, Troschel, and other authors. With it must be included a species recently described by M. Morelet, in the 'Journal de Conchyliologie' (tome xvii. No. 2, April 1877), under the name of *Megalomastoma litteratum*.

Mascaria crocea is peculiar to the Mauritius, where it was found alive by Sir David Barclay on the hills in the neighbourhood of Black River. *M. litterata* is from Madasgascar, and was collected there in some abundance by Mr. Waters.

5. Descriptions of nine new Species of Land and Marine Shells from various localities. By George French Angas, C.M.Z.S., F.L.S., &c.

[Received February 16, 1878.]

(Plate XVIII.)

Bulimus watersi, n. sp. (Plate XVIII. fig. 1.)

Shell imperforate, elongately turreted, rather thin, shining, finely irregularly longitudinally striated, the striæ here and there forming tessellated rows and patches, pale olive, lighter towards the apex, mottled with small brown spots and irregular markings, with indications of two paler bands, one below the suture, and the other towards the base of the last whorl; spire acuminate, somewhat obtuse at the apex; whorls 9, rather convex, the last of equal length with the spire; sutures impressed and slightly crenulate; aperture subovate, one third the length of the shell, pale violet within; outer lip simple, scarcely thickened at the edge; columella with a slight callus below, a little arcuate towards the base.

Alt. 3 inches, diam. 11 lines; length of aperture 1 inch.

Hab. Madagascar.

This species is allied to *B. obtusatus*, Gmel., and *B. moreleti*, Desh., with which, including perhaps *B. clavator*, Petit, and *B. balstoni*, Angas, it combines to form a natural group of Madagascar *Bulimi*. The specimen from which my description is taken is in the collection of Sir David Barclay. There is a second example in that of Mrs. De Burgh.

I would here correct the name of a species in the list I gave in the Society's 'Proceedings' for 1877 (p. 527), of certain land shells from the Island of Madagascar that had been submitted to me by Mr.

Edward Bartlett. For *Helix cornu-giganteum*, Chemn., read *H. guestieriana*, Crosse (see Journ. de Conchyliologie, 1868, p. 269, pl. ix. fig. 4). A large series of specimens of this latter species were sent home lately from Madagascar by Mr. Waters; and although I observed certain peculiarities about them on comparing them with typical specimens of *H. cornu-giganteum*, I then hesitated to separate them from the latter species, regarding them as possibly a local variety, and not being aware at the time that they had been elevated to the rank of a species by M. Crosse. I have now great pleasure in adopting that gentleman's name.

Helix guestieriana differs from *H. cornu-giganteum*, Chemn. (=*H. vesicalis*, Lam.), in being somewhat smaller, paler in colour, and more tumid, with the base less flattened and the umbilicus concealed by a callus, and especially by having the inner lip constantly more or less *granulated*—a character that I do not see referred to in the description of the shell in the French Journal.

Bulimus (Otostomus) quadrifasciatus, n. sp. (Plate XVIII. figs. 2, 3.)

Shell elongately ovate, rimate, moderately solid, shining, finely longitudinally striated, white, transversely banded with light brown, the last whorl with four bands, the central one being the widest; spire conical, apex obtuse; whorls 6, somewhat convex; aperture oval, equal to the spire; outer lip flattened and expanded at the base.

Alt. 1 inch 3 lines, diam. 6½ lines.

Hab. Ecuador.

Bulimus (Otostomus) napo, n. sp. (Plate XVIII. figs. 4, 5.)

Shell rimate, ovately fusiform, moderately solid, shining, very finely and irregularly striated, pale fawn-colour, with a narrow white band next below the suture and a similar white band surrounding the perforation; spire sharply conical, somewhat obtuse at the apex; whorls 6, slightly convex; aperture ovate, same length as the spire; outer lip expanded and flattened at the base, white behind, bordered by a narrow suffused orange band.

Alt. 1 inch 3 lines, diam. 5½ lines.

Hab. Ecuador.

Bulimus (Eurytus) eros, n. sp. (Plate XVIII. figs. 6, 7.)

Shell imperforate, oblong-ovate, thin, very finely and closely shagreened all over, the apical whorls marked with irregular longitudinal striæ, light-greenish olive, ornamented with small spots and cloudy patches of a darker colour; spire very short, apex obtuse, pink; whorls 4, rather convex, the last very large; aperture ovate, more than two thirds the length of the shell, effuse below; outer lip slightly expanded and reflexed, which, together with the columella and the interior of the aperture, is of a bright rose-colour.

Alt. 1 inch 5½ lines, diam. 8 lines.

Hab. Ecuador.

A beautiful species, characterized by its closely granulated sculpture, and the rosy coloration of the mouth.

ROSTELLARIA LUTEOSTOMA, n. sp. (Plate XVIII. figs. 8, 9.)

Shell fusiform, solid, light brown, paler below the sutures; spire attenuated, apex sharp-pointed; whorls 15, the first 9 or 10 longitudinally strongly plicate, those nearest the apex being cancellated with fine transverse ridges, the lower whorls nearly smooth, with a few concentric grooves near the base or the last whorl; columella covered with a strong tumid polished callus; outer lip with 5 digitations on the lower half of the margin; posterior canal extending upwards beyond the centre of the third whorl; beak moderate, nearly straight in the young shell, somewhat curved outwards in the adult; aperture golden yellow, deepest on the lower portion of the columella.

Length 4 inches 3 lines, diam. 1 inch 3 lines.

Hab. Kurrachi, near the mouth of the Indus.

This beautiful shell forms an interesting addition to the restricted genus *Rostellaria* (*Gladius* of Klein), of which hitherto only about half a dozen recent species have been described.

All the known species inhabit the Asiatic seas, none having been met with in any part of the New World. The two examples (one young and the other in the adult state) from which I have taken my description, are from the collection of Sir David Barclay, and are, so far as I am aware, unique in this country.

MITRA (COSTELLARIA) LINCOLNENSIS, n. sp. (Plate XVIII. figs. 10, 11.)

Shell acuminately fusiform, solid, whitish, tinged with irregular longitudinal chestnut flames, with a narrow band of interrupted spots encircling the centre of the whorls, the lower half of the last whorl chestnut, with a faint band of reticulated brown and white spots in the middle; whorls 7, a little convex, with numerous, stout, rounded longitudinal ribs, which are slightly nodulous below the sutures; interstices smooth, sutures impressed; spire longer than the aperture; outer lip simple, a little contracted below; columella with 4 strong plaits, the posterior one the largest: basal canal short, slightly recurved.

Length 7, breadth 2 lines.

Hab. Port Lincoln, South Australia.

MITRA SCHOMBURGKI, n. sp. (Plate XVIII. figs. 12, 13.)

Shell ovately fusiform, moderately solid, strongly longitudinally ribbed, the ribs becoming nearly obsolete towards the lower portion of the last whorl, livid brown, with a broad pale suffused band on each whorl and four narrow dark brown lines encircling the last whorl, one above and three below the band; whorls $6\frac{1}{2}$, convex; spire turreted; sutures impressed; aperture subovate, equal in length to the spire; outer lip simple, arcuate, sulcate internally;

columella with three stout plaits, which are carried round the base of the last whorl.

Alt. 5, diam. 2 lines.

Hab. South Australia.

SIPHONARIA ALBIDA, n. sp. (Plate XVIII. figs. 14, 15.)

Shell elongately ovate, subsymmetrical, sharply conical, rather thin, white; ribs very numerous, rounded, unequal, crossed more or less with squamose ridges; apex subcentral, prominent, smooth, recurved; siphuncle inconspicuous; interior white, shining, almost pearly.

Long. 8, lat. 6, alt. $3\frac{1}{2}$ lines.

Hab. St. Vincent's Gulf, South Australia.

A pure-white conical species, with the ribs very numerous and crossed with irregular squamose ridges.

LEDA (ADRANA) NEWCOMBI, n. sp. (Plate XVIII. figs. 16, 17.)

Shell equivalve, very inequilateral, flattened, lanceolate, the posterior side obtusely angled, the anterior terminating in a point slightly curved upwards, thin, shining, white, sculptured with very fine, regular, close-set concentric striæ, which on the posterior side extend nearly to the margin of the valves, whilst anteriorly they cease abruptly, leaving about one third of the surface smooth, faintly marked with the lines of growth only; front dorsal margin very slightly concave, two thirds the length of the shell; ventral margin somewhat arcuate behind, flattened below, and again slightly arcuate towards the anterior extremity; beaks very small, approximate, incurved.

Length 1 inch 4 lines, alt. 4 lines, lat. $2\frac{1}{4}$ lines.

Hab. Dredged in Navy Bay, Aspinwall, in 8 fathoms (*Dr. W. Newcomb*).

I have much pleasure in dedicating this new species of *Adrana* to my old friend and correspondent Dr. W. Newcomb, of Ithaca, a distinguished American conchologist.

EXPLANATION OF PLATE XVIII.

Fig. 1. *Bulimus watersii*, p. 311.
2, 3. —— *quadrifasciatus*, p. 312.
4, 5. —— *napo*, p. 312.
6, 7. —— *eros*, p. 312.
8, 9. *Rostellaria luteostoma*, p. 313.
Fig. 10, 11. *Mitra lincolnensis*, p. 313.
12, 13. —— *schomburgki*, p. 313.
14, 15. *Siphonaria albida*, p. 314.
16, 17. *Leda newcombi*, p. 314.

6. Additional Notes on the Chiroptera of Duke-of-York Island and the adjacent Parts of New Ireland and New Britain[1]. By G. E. DOBSON, M.A., M.B., F.L.S., &c.

[Received Feb. 18, 1878.]

The following notes are derived from an examination of a second collection of Chiroptera, consisting of forty-five specimens, recently

[1] See P. Z. S. 1877, p. 114.

sent home by the Rev. G. Brown, C.M.Z.S., and kindly placed in my hands by Mr. P. L. Sclater, Secretary of the Society.

This second collection contains no species which were not represented in the first; but the opportunity afforded of examining additional specimens of certain species enables me to correct and add to the notes published in my first paper, and to show that the Chiropterous fauna of Duke-of-York Island is even more characteristic of the Australian region than there stated.

PTEROPUS MELANOPOGON, var. NEOHIBERNICUS.

Pteropus melanopogon, var. *neohibernicus*, Peters, Monatsb. Akad. Berl. 1876, p. 317.

Three specimens, an adult female with forearm 7″·3, one younger with forearm 7″·0, and one quite immature with forearm 6″·5. All have the ear one inch in length, and quite similar in shape to that of typical examples of *Pt. melanopogon* from the Malay archipelago. The index finger appears to be remarkably long, probably proportionally longer than in any other species of the genus. In the largest specimen (with forearm 7·3 inches) it is 5·8, the metacarpal bone of the middle finger being 5·1, while in a full-grown specimen of *Pt. melanopogon* from Bouru (with forearm 7″·75), in which the metacarpal of the middle finger is 5″·2, the index finger measures 5″·5 only. In all the specimens the second upper premolar is separated by a rather narrow space from the canine, and the premolars and molars are very large, but with scarcely developed internal cusps, and no trace of basal projections. In the older female the fur is very short, and almost bright yellowish brown throughout, the back of the head and across the shoulders brighter than the rest of the body, on the thighs brown, the fur of the face and throat of a reddish brown shade, but no trace of a black patch of hairs beneath the chin and throat. In the younger female the fur is much longer and darker, but, as in the older specimen, it is reduced to a narrow line about an inch wide along the centre of the back; the face about the eyes, the cheeks, and under the muzzle and throat reddish brown, the whole under surface paler reddish brown; the back of the head bright yellow; the neck above and on the sides light yellowish brown, shoulders brighter; the narrow line along the centre of the back bright yellowish, edged with dark brown, which colour extends upon the hairs clothing the thighs. The immature specimen rather resembles the older one; but the back of the head is paler yellow, the face and chin darker brown, and the fur along the back is much broader and almost uniformly light brown.

PTEROPUS CAPISTRATUS.

Pteropus capistratus, Peters, Monatsber. Akad. Berl. 1876, p. 316 (with a coloured plate); Dobson, Proc. Zool. Soc. 1877, p. 116.

A single female specimen, not differing from those previously described; the black ring surrounding the muzzle between the ears

and eyes very conspicuous where it passes round the lower jaw in front of the throat.

CYNONYCTERIS BRACHYOTIS.

Cynonycteris brachyotis, Dobson, P. Z. S. 1877, p. 116.

A large number of specimens representing all ages of this animal; so that the full size of the species can be determined with considerable certainty. This scarcely differs from that given in my original description. In the largest specimen, an adult male, the forearm is 2·9 inches, or only one twentieth of an inch longer than that of the type. In all, the peculiar nakedness of the shoulders is present, and the fur of the sides of the neck radiates from a central point near the place of origin of the antebrachial membrane, corresponding to the position of neck-glands, which, in the adult male referred to above, are covered on each side by a circular tuft of coarse yellow hairs, as in most of the species of the genus *Pteropus*. The colour of the fur is very similar in all, being greyish yellow-brown, the base of the hairs darker; in the immature specimens the fur is longer and darker throughout. In all, except the oldest individuals, there is a minute first upper premolar between the approximated canine and second premolar, generally so small as to be seen with difficulty.

CEPHALOTES PERONII.

Cephalotes peronii, Geoffroy, Ann. du Muséum, xv. p. 104 (1810).

More than one third of the whole collection consists of specimens of this species, which, therefore, appears to be very abundant in these islands.

From the young with milk-dentition to the aged with worn teeth, all have the back equally naked from the shoulders backwards. They correspond closely in measurements and other respects with specimens from other parts of the Austro-Malayan subregion, of which this species is eminently characteristic.

MELONYCTERIS MELANOPS.

Melonycteris melanops, Dobson, P. Z. S. June 1877, pp. 119–121, figs. 4–7, and pl. xvii.

Pteropus (*Cheiropteruges*) *alboscapulatus*, Ramsay, Proc. Linn. Soc. New South Wales, July 1877, p. 17.

An adult female, scarcely differing in the colour of the fur from those previously described, having also the white spot near the place of origin of the antebrachial membrane from the shoulder. The canines appear to be as large as in the male. The wings are attached posteriorly, as in other specimens, to the base of the third toe, or to the space between the bases of the second and third toes.

This is undoubtedly the species described under the name of *Pteropus* (*Cheiropteruges*) *alboscapulatus* by Mr. Pierson Ramsay in

the publication referred to above, as may be seen by comparing the descriptions. In my original description of this species, I did not notice the white spot on the shoulder, very correctly described by Mr. Ramsay, as it was completely concealed from view in the specimens examined by me (owing to the manner in which the dry skins were preserved, the wings being brought forward in front of the head); nor have I referred to the yellow spots on the wings, which, as they do not appear in this specimen, may be accidental.

PHYLLORHINA TRICUSPIDATA.

Rhinolophus tricuspidatus, Temm. Monogr. Mammal. ii. p. 20, pl. 32. figs. 11, 12 (1835–41).

An immature specimen with light-brown fur, of a dull shade throughout, very different from the bright reddish brown fur of the adult individual from the same locality referred to in my former paper.

PHYLLORHINA CERVINA.

Rhinolophus cervinus, Gould, Mammals of Australia, iii. pl. xxxiv. (1853).

A careful examination of the additional specimens in this collection has shown me that I was mistaken in referring to *Ph. galerita*, Cantor, of the Oriental region, a single specimen in the first collection, which really belongs to the Australian representative of that



Phyllorhina cervina.



Phyllorhina galerita.

species. Recent specimens, and specimens preserved in alcohol, of this Australian species (*Ph. cervina*, Gould) are readily distinguished from the closely allied *Ph. galerita* by the much larger frontal glandular sac in adult males, by the much narrower anterior portion of the horizontal horseshoe-shaped nose-leaf (compare the woodcuts above), and by the much greater length of the calcaneum. In dried skins, however, these parts become so altered in appearance that it is almost impossible to distinguish the species.

PHYLLORHINA CALCARATA.

Phyllorhina calcarata, Dobson, P. Z. S. 1877, p. 122, fig. 8.

A specimen of an immature individual with (as in the type) vertical ridges dividing the concave front surface of the transverse erect

portion of the nose-leaf, and having also the last caudal vertebra free.

Ph. coronata, Peters, from the Philippine Islands, approaches this species in size and in the remarkable length of the calcaneum; but the very different form of the nose-leaf and ears at once distinguishes it.

7. On *Latrunculus* and *Crystallogobius*, two remarkable Forms of Gobioid Fishes. By Robert Collett, of Christiania, C.M.Z.S.

[Received February 18, 1878.]

Upon different occasions, at meetings of the Scientific Society of Christiania, I have communicated my observations on a singular group of our Gobioid fishes, which differ from the typical genus *Gobius* not only in the almost perfect transparent body, but also in differences in the structure of the scales, fins, and the form of the body[1].

As the said group in several points offers much of interest, I will endeavour to relate the general results of these researches, all of which have been made in the Christiania fjord, a most favourable locality for marine fishes and invertebrates. From these researches I find:—

1. Each of the genera, *Latrunculus*, Günth., 1861, and *Crystallogobius*, Gill, 1863, include one single species, *L. pellucidus* (Nardo) 1824, and *C. nilssoni* (Düb. & Kor.) 1844.

2. *Latrunculus pellucidus* (Nardo) from the Mediterranean, *L. pellucidus* (Kessler) from the Black Sea, *L. albus* (Parn.) from Scotland, and *L. stuwitzii* (Düb. & Koren) from Norway are all one and the same species.

3. The males of both species have a dentition totally different from that of the females; in *L. pellucidus* these teeth are only developed during the spawning-season.

4. The female of *C. nilssonii* has the first dorsal and the ventral fins rudimentary; and the ovaries of this species reach back far behind the vent.

5. Both species are *annual* vertebrates, and accomplish their life in the course of one year.

Genus Latrunculus, Günth.

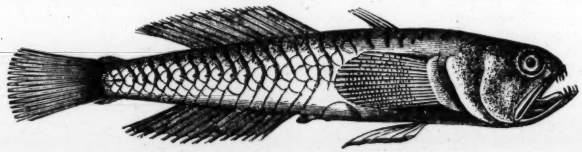
Genus *Latrunculus*, Günth. Cat. Acanth. Fishes, Brit. Mus. vol. iii. p. 80 (1861).

Body transparent, elongate, rather compressed, covered with large, deciduous, rounded scales attached to parallel muscular impressions. Both sexes dentiferous, the mature male with a series of long teeth,

[1] Slægten *Latrunculus* og dens nordiske Arter (Forh. Vid. Selsk. Christ. 1872). Norges Fiske, med Bemærkunger om deres Udbredelse (Tillægsh. til Forh. Vid. Selsk. Christ. 1874). Om Slægterne *Latrunculus* og *Crystallogobius* (Forh. Vid. Selsk. Christ. 1876).

and with strong canine teeth, which form the hinder series in the upper jaw. Two separated dorsal fins, the first composed of 5 spines. Ventral fins united, gill-openings rather wide. Pseudobranchiæ present.

Fig. 1.



Latrunculus pellucidus ♂ ad., in the breeding-season, ♀.

L. PELLUCIDUS (Nardo).

1824. *Gobius pellucidus*, Nardo, Giorn. Fis. Chim. Stor. Nat. Pavia, tom. iii. Osserv. p. 7 (*teste* Günther).

1826. ? *Aphia meridionalis*, Risso, Hist. Nat. Eur. Mér. tom. iii. p. 287 (Paris, 1826).

1837. *Gobius albus*, Parn. Trans. Roy. Soc. Edinb. vol. xiv. p. 137, Feb. 1837 (Edinb. 1840).

1844. *Gobius stuwitzii*, v. Düb. & Kor. Kgl. Vet. Akad. Förhandl. 1844, p. 51, tab. ii. fig. 4 (Stockh. 1846).

1859. *Gobius pellucidus*, n. sp., Kessl. Bull. Soc. Nat. Mosc. 1859, tom. xxxii. No. 2, p. 260 (Mosc. 1859).

1861. *Latrunculus albus*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 80, and p. 556 (Lond. 1861).

1861. *Latrunculus pellucidus*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 556 (Lond. 1861).

1861. *Gobiosoma stuvitzii*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 86 (Lond. 1861).

1863. *Boreogobius stuvizii*, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (Philad. 1864).

1872. *Latrunculus stuwitzii*, Coll. Forh. Vid. Selsk. Christ. 1872, p. 9 (Christiania, 1873).

Teeth in the mature male long and cylindrical, and with strong curved canine teeth in both jaws; teeth in the female and the immature male minute. The ventral fins united to a funnel, with the longer rays towards the body. The ovaries do not project behind the vent.

D^1 5, D^2 13 (12); C. 10+17+10; A. 14; V. 6; P. 16; Lin. lat. 25; Vertebr. 27; M. Br. 5.

A. *Remarks on the Synonymy.*

The first northern form of the transparent Gobioids was discovered by Parnell in the Scottish friths, and shortly described in Feb. 1837, in the 14th volume of the Trans. of the Royal Society of Edinburgh, under the name of *Gobius albus*. His description (which, by the way,

is rather incomplete) has afterwards, without any further addition, been repeated in the various editions of Yarrell's History of Brit. Fishes. In May, 1844, Von Düben and Koren in Öfv. Kgl. Vet. Akad. Förh. for the same year introduced two other species of the same group, both of which had been previously found, in Dec. 1834, in the district of Bergen, Norway, by the late naturalist, Mr. P. Stuwitz, after whom one of them was named *Gobius stuwitzii*. The last-named species had certainly, as pointed out by the authors, a decided similarity to the Scottish *G. albus*. Still the difference in the construction of the body, as well as of the teeth, was so obvious that they could not easily be mistaken. Instead of being plump, like *L. albus*, with the head thick, the cleft of the mouth wide, the teeth long, the interorbital space wide, the second dorsal and the anal fins even, *G. stuwitzii* was slender, with the head thin, and the cleft of the mouth short, the teeth extremely feeble, the interorbital space narrow, and the second dorsal and the anal fins diminishing behind. In 1861, Dr. Malm, in Bohuslän, Sweden, found both the named species in fully developed state, one of them (*G. stuwitzii*) with ripe spawn; and he therefore gave, in July 1863, in the Förh. Skand. Naturf. 9. Möte, comparative diagnoses of them, chiefly based upon the structure of the teeth and the vertical fins.

When Dr. Günther, in 1861, issued the volume of his Catalogue of the Fishes of Brit. Museum, in which he treats of the Gobioids, *G. albus* was made the type of the new genus *Latrunculus*[1]; but, from the description of *G. stuwitzii*, he did not venture to include this under the same genus; for want of a better place he inserted it under the genus *Gobiosoma*, Gir., as it was still undecided that it possessed scales, which, for the first time, was proved by Dr. Malm in 1863. Prof. Gill, in the Proc. Acad. Nat. Sci. of Philadelphia for 1863, even made it a type for a new genus *Boreogobius*, without giving even a single word of reason for this alteration; and Dr. Bleeker, in 1874, followed in his steps in the Synopsis of the Gobiidæ, which he communicated in the 9th volume of Arch. Néerl. Sci. Exact. et Nat.

Since the autumn of 1871, I have found the form *L. stuwitzii* in the Christiania fjord in great numbers, and have collected innumerable specimens during the autumn months. All these specimens have fully agreed with the original description given by Düben and Koren, and consequently are constantly different from that of Parnell's *L. albus*. Having provided myself during the first autumn with what I thought sufficient materials, consisting of several thousand specimens, I gave, in the Forh. Vid. Selsk. Christiania, 1872, a short description of the species, comparing it with the descriptions at hand of *L. albus*, in which I endeavoured as much as possible to keep the two species separate. During the succeeding years I tried amongst the great quantities of *L. stuwitzii* to find *L. albus*, but without

[1] The name *Latrunculus* was employed by Dr. Gray as early as in 1847, for a Gasteropod (Proc. Zool. Soc. Lond. 1847, p. 139). But, as I was informed by my friend the late Dr. Mörch, of Copenhagen, this name is quite superfluous, and will hardly ever be reemployed for that mollusk.

success. In the winter months the fjord is covered with ice; and in the spring and summer I had no opportunity of tracing them. In August 1874 I certainly found a couple of breeding females, together with some others which had already spawned; but none of these differed in any point from the typical *L. stuwitzii*; and in September again the young of the year solely were seen. Therefore I could add nothing of importance to my previous researches published in the 'Norges Fiske' in 1874.

It was almost accidentally that, in June 1875, I found one of the spawning-places; and during a couple of excursions I succeeded in collecting a considerable number of fully developed specimens of both sexes. It then became quite evident that *L. stuwitzii* was based on the female and the immature males of the same species, the mature males of which were *L. albus*. On several occasions examples of typical *L. albus*, which all, without exception, proved to be old males, were taken from the same shoal as *L. stuwitzii*, all of which were females ready for spawning. Another lot consisted of somewhat younger specimens in various stages of transformation between both forms, all full-grown, but with the eggs and milt not yet perfectly ripe.

Von Düben and Koren described their species from four specimens taken in winter (in the month of December), and consequently out of their spawning-season; but Parnell, on the contrary, had for the description of his *Gobius albus* 50 specimens caught in June in Solway Frith, thus just during their breeding-time. From Parnell's description we may conclude that he had only mature males at his disposal; nor does Dr. Günther, in compiling his catalogue (1861), seem to have had at his disposal any females,—as may be seen from the fact that both these authors speak only of individuals with long teeth. By the kindness of Dr. Günther I have received three specimens of the Scottish form, collected by Parnell himself; and one of these, curiously enough, proves to be a female with the minute teeth and the sloping fins, in other words, a typical *L. stuwitzii*. Thus Parnell had overlooked female individuals, perhaps few in number, and had drawn his description solely from the males.

Having endeavoured to identify the two species of Western Europe, it remains to discuss the third and fourth species of this genus, the *L. pellucidus* of Southern Europe.

In 1824, according to Dr. Günther, a description was given by Nardo of a Mediterranean form under the name of *Gobius pellucidus*. I have not had an opportunity of seeing the periodical in which Nardo gave his original description (Giorn. Fis. Chim. di Stor. Nat. d. Pavia); but from the title of the paper ("Osservazioni ed aggiunte all' Adriatica Ittiologia") it seems that his specimens were taken in the Adriatic. The species since Nardo's time has often been mentioned by those naturalists who have treated upon the fauna of the Mediterranean, and, as it appears, under somewhat different names. In Hist. Nat. Eur. Mérid. tom. iii. p. 287 (1826), Risso mentions a species under the name *Aphia meridionalis*, n. gen. et sp.,

which perhaps may be the same as Risso's, although it can hardly be proved with any certainty, as the description is, in the first place, too incomplete, and, secondly, disagrees in several respects with our species. It is therefore scarcely advisable to adopt the generic name given by Risso; but if this naturalist really had in view *L. pellucidus* (which is very probable), his description, besides being incorrect[1], is also incomplete, from no notice having been taken of the mature male. Another generic name, which is ascribed to Nardo, is *Brachiochirus* (*cf.* Bonap. Cat. Method. Pesci Europ. p. 64, Napoli, 1846, and Atti Ist. Veneto, tom. v. ser. 3, p. 796, Venezia, 1859–60); but I have had no opportunity of examining the work wherein that genus is established[2]. Canestrini mentions the species, in his memoirs on the Gobioid Fishes found in the Gulf of Genoa (Arch. Zool. Anat. Fisiol. fasc. ii. vol. i. p. 152), under the name of *Gobius albus*, Parn. This author shows the difference in the structure of the teeth between the sexes in the Mediterranean form, without, however, bringing his description to bear upon the young male.

Last year I received from Prof. G. O. Sars a couple of specimens of the Adriatic form, collected by him during a stay in Trieste in the spring of 1876. As it seems to abound there, and is well known to all fishermen, it is very possible that it is Nardo's *G. pellucidus*; and it has therefore been of much interest to me to be able to make a comparison between this and the northern form, with which it agrees in development (*L. stuwitzii*). This comparison has been thoroughly conclusive of the fact that they are identical. The specimens from Trieste were collected in the month of March, and had then not yet reached their fully mature state. Their total length varies between 42 and 44 millims.; otherwise the length of the head, the size of the eyes, the general structure of the body, the number of rays and of the transverse muscular striæ—further, the teeth—in short, every thing, down to the most minute spots of the coloration, completely agrees with specimens of the same size and state of development from Christiania.

Finally, Kessler, in Bull. Soc. Imp. Nat. Mosc. tom. xxxii. (1859), gives a tolerably detailed description of a form from the Black Sea (Odessa), which he calls *Gobius pellucidus*, n. sp., being apparently ignorant of Nardo's previous description of a species of the same name.

With regard to this form, it does not seem to differ at all from *L. albus* (or the male in spawning-season). The distinction between them, which Dr. Günther thinks may be made, that Kessler's species has a larger diameter of the eye, namely $\frac{1}{4}$ of the length of

[1] This is especially the case with regard to the description of the fins and their rays; the number of the rays in the first dorsal is also omitted, which is a point of great importance.

[2] If in Risso's *Aphya* and Nardo's *Brachiochirus* we can recognize *Latrunculus pellucidus*, both these names will have priority over *Latrunculus*, Günther. The decision of this, as well as other similar questions of priority, I leave to those who have greater opportunities of examining the literature of Southern Europe than can be obtained here in the library of the University of Christiania.

the head, and equal to the snout, whilst, on the contrary, the eye of *L. albus* is contained 5 times in the length of the head, and is shorter than the length of the snout, is of little consequence, as in fact both the original specimens of Parnell and those from the Christiania Fjord have rather the proportions of length given by Kessler. Although this author expressly remarks that he knows the mature females, he must have overlooked (as well as Parnell) the differences between these and the males, and in his description (for instance, of the structure of the teeth) only have taken notice of the latter.

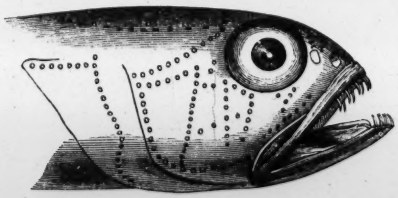
B. *General Description.*

Before entering into a more detailed description of the species in general, I will briefly point out some of the principal peculiarities which separate the individuals in the different periods of life. From this it will be seen that the difference in the sexes of the species in the fully developed state is considerably greater than with any of our northern species of the typical genus *Gobius*.

Out of the spawning-season the males and the females (which at this time only exist in the shape of young specimens) are exactly alike in appearance, although they soon reach the size of the old ones. The body is slender, the head pointed; the jaws, in consequence, are less oblique, and seem, therefore, to be shorter. The teeth are all uniform, minute, and form a close single row. The caudal fin is slightly emarginated, the second dorsal and the anal diminishing behind. In this stage they are all typical *L. stuwitzii*.

The nearly mature males, the milt of which is not yet quite ripe, have the head considerably more thickened, and longer jaws; besides the minute teeth, there is become visible an outer row of cylindrical teeth, yet not full-grown, but having reached a greater length than the others. The posterior rays of the second dorsal and the anal fins are still lower than the anterior; the caudal is slightly emarginated, or square.

Fig. 2.



Head of *Latrunculus pellucidus*, mature male, magnified.

The mature males have an average total length (the caudal included) of 42–43 millims. (a few have the milt ripe, with a total length of 40 millims.), but reach a size of 50–51 millims. The body is plump; the head thick and tumid; the interorbital space broad; the cleft of the mouth wide, with fully developed teeth of only one

kind, few in number, but long and cylindrical. The posterior rays of the anal and second dorsal fins are, as a rule, not shorter than the anterior, making the fins about even in their whole length. The caudal fin is slightly square, with rounded edges in the young individuals, but truncated in the elder ones.

The nearly mature females, not yet quite ready for spawning, agree in general with the individuals in the immature state, from which they differ in the somewhat swollen belly.

The females ready for spawning have an average length of about 42 millims.; many having the spawn ripe are of a length of 38 millims.; none reach a length of more than 46 millims. (the caudal included). The head is not visibly thickened, but is about the same as during the whole young period; it is rather more pointed than in the male; the cleft of the mouth is considerably smaller, although the jaws may possibly have become a trifle longer than before. The teeth, however, have not undergone any change, but are uniform, exceedingly fine, and placed in the same row as in the young individuals. The caudal fin is emarginated, and the anal and the second dorsal are tapering behind, as is the case in their younger state.

The construction of the body is slender and elongated, laterally compressed; and it is only during the spawning-season that the body of the male becomes thicker and more plump.

A specimen of medium size out of the spawning-season has a total length of 40 millims., of which the head is 9 millims.; and this is contained about 4·4 in the total length (the caudal fin included). The greatest height is 5·5 millims., or contained 7·2 in the total. The vent is situated about 2 orbital diameters nearer the snout than the root of the caudal.

In the spawning-season the body becomes fully developed, although the total length does not increase. In a male with a total length of 40 millims. the length of the head is 9·5 millims. (4·2 in the total); in the female about the same as before.

The eyes have a diameter of 2 millims., and occupy $\frac{2}{9}$ of the length of the head. The orbital space, which, as a rule, is narrow, and does not reach the breadth of an orbital diameter, has in the mature male fully the last-named breadth.

The number of the gill-rays is 5; the gill-openings are wide, and stretch forwards to about the middle of the orbit.

The mouth is oblique, and the lower jaw longer than the upper, the maxillary extending to below the middle of the orbit. During the spawning-season the jaws of the male become considerably larger and more oblique; at the same time, the head and all parts of the body become swollen, the jaws extending much deeper under the eye.

The number of the vertebræ is 27; the processus spinosi are very long, and reach almost to the dorsal and ventral line. The medulla spinalis extends as far back as to the middle of the 22nd vertebra.

The teeth.—Before the spawning-season the structure of the teeth is exactly alike in both sexes. In each of the jaws is found on both sides a single series of 20–25 minute and very closely fitted

teeth, which project very little beyond the jaws. Only the innermost part of the lower jaw is entirely toothless. These teeth make their appearance very early in the young. In a young specimen of scarcely 14 millims. length, some very minute (microscopical) teeth are already visible in the front part of the lower jaw, although they cannot with certainty be seen in the upper. In specimens of the total length of 23 millims. there are some small teeth visible in both jaws; and on being dried, one may see that some of them are already developed; still they continue to be minute until the specimens have reached their full length.

The teeth of the female undergo no special alteration the whole of their life through, but continue during the spawning-season in the same state as before; but in the males, on the other hand, these minute teeth of young specimens begin to disappear towards the spawning-season, and are replaced by a set of long and cylindrical ones. These long teeth do not proceed from the minute teeth, but constitute an entirely new set, which shoot forth at the same time as the orignal set disappears. In the specimens wherein the organs of generation are still not fully mature, both sets of teeth are visible for a short period at the same time, the new set only half developed.

Finally, during the spawning-season all the minute teeth of the male have almost entirely disappeared, and are replaced by the new, long, and almost straight teeth, situated at a remarkable distance from each other, and chiefly to be found on the front part of the jaws. In the lower jaw their number is 4, or sometimes but 3, on each side; they are not particularly pointed, but almost cylindrical, only slightly curved, and placed almost vertically upon the outer edge of the jaw. At a little distance below and inside the last of these teeth, on each side, is found a sharp, curved tooth (canine) directed backwards and almost in the form of a claw. In the posterior half of the jaw the prolonged teeth are missing, a few of the minute teeth of the young period still remaining here.

In the upper jaw the number of the long teeth is 5 on each side, of which a few (1–2) are also to be found behind the middle of the jaw. In the upper jaw there is also found, inside the ordinary row on each side, the curved canine, which is directed backwards; this canine is placed further in front than the opposite one in the lower, or nearly at the point of the jaw. There may further be found in the posterior part more or less remaining of the original minute teeth, whilst these only exceptionally are found at the point of the jaw.

The fins.—The first dorsal fin has 5 rays, and is a little higher in the full-grown males than in the females, without, however, reaching the height of the body. All the rays are about evenly high, undivided, feeble, and rather closely set. This is one of those fins which appear latest, and is entirely wanting in specimens of a total length under 16 millims., wherein all the remaining fins have already got their rays. In individuals of the total length of about 22 millims. this fin is found with extremely feeble and short spines, which are often difficult to detect.

The distance between the two dorsals is at least so great that the rays of the first can never reach to the commencement of the second.

The second dorsal fin has 13, rarely only 12 rays, the last of which is a double one, although not divided in many young individuals. In the full-grown female, as well as in immature individuals of both sexes, it strongly decreases posteriorly: the first is only half as long as the second and third, which are the longest; after this the length diminishes successively, and the last (the double one) has scarcely the length of the first. The first ray is not articulated; the remaining are all articulated; the first and the second are single, the remaining divided at the point (the double ray only in its innermost branch). In the mature male the posterior rays are lengthened, the fin becoming almost even; the point of the posterior rays reaches a distance of the diameter of the eye from the root of the caudal fin, this distance being considerably larger in the females and young individuals. The caudal fin has 17 articulated rays, besides a row of 10 short, feeble, unarticulated, supplementary rays on each side. All the articulated rays (with the exception of the two outermost on each side) are twice divided in the outer two thirds of the fin. The length of the fin does not exceed considerably the height of the body. Its form in young specimens, as well as in the female is always slightly emarginated, which is also the case with a great number of the males during the spawning-season; other males have the caudal fin square, with rounded corners; and it is only in the case of the older that the middle rays are longer than the other ones, by which means the form of the fin becomes rounded.

The anal fin has 14 rays, the last of which is a double ray. In its construction and position it agrees in general with the second dorsal; and having a ray more, it stretches a little further back than this.

The pectoral fin has 16 articulated rays, all of which, with the exception of the outermost on each side, are divided in the outer third of the fin, and after the fourth ray doubly divided. The form is somewhat pointed; the point is scarcely the distance of one diameter of the eye from the vent. In accordance with the rule in the generality of fishes, this fin is one of the latest developed; in a specimen with a total length of 19 millims., it consists only of a rounded flap, in which there is a vestige of a few rays.

The ventral fins have their origin beneath the root of the pectorals, and consist each of 6 rays. These together form the more or less developed funnel, which is typical of the subfamily *Gobiinæ*. When expanded, the opening of the funnel forms an oblong ring, which runs parallel with the ventral line. All the rays are three times divided down to the root, and are very movable. In the full-grown male the extreme point reaches almost as far back as the pectorals. In the female and the immature males the ventrals are very much shorter, the funnels and the outer division of the rays indistinct; the extreme point is distant more than half the length of the head from the vent.

The mucous glands[1], the true nature of which has perhaps not yet positively been proved, are to be found on all parts of the head in longer or shorter rows, which vary comparatively little in the different specimens. To give a more detailed description of them would require too much space; but a drawing (see fig. 2, p. 323) has been taken from a comparison of several specimens. Two parallel series across the hinder part of the interorbital space are easy to be observed, as may also two others, running along the upper side of the snout, and sending forth some shorter series down to the nostrils. The rest of these glands reach as far back as to the first dorsal fin; and shorter rows are found immediately behind the ventrals.

The scales and the skin.—The whole body, with the exception of the head and fins, as well as the neck, throat, and belly, down to the vent, is covered with large and very easily deciduous scales. These are fastened to transverse muscular impressions, which bend together in the lateral line of the body, where the vertebræ are connected. The scales are arranged along the sides of the body thus:—First a series of 25 scales are fixed along the lateral line; above and below this row run two other rows; so that together there are 5 rows between the dorsal and ventral line. The scales are perfectly transparent, membranous and cycloid; in the lateral line they are a trifle smaller than in the other rows; they are comparatively large, having a diameter of nearly 1 millim., and are few in number. According to the above statement the total number of scales would be hardly more than 100 on each side of the body. The period in which the scales are developed I have not been able to observe to a certainty, as the scales in young specimens seem to be still more easily deciduous than in the older. In the smallest specimen I have found, with a total length of 13 millims., the transverse impressions, to which the scales are fastened, are already visible; but I have not detected the scales themselves before the specimens have attained about half their size.

The colour.—When alive the whole body is almost perfectly transparent, having only a few minute stellulate pricks in the skin. One may without difficulty count the vertebræ from the outside, and clearly distinguish the brain with its different parts, as well as the pulsation and the blood-corpuscles. The most coloured part of the body is the eye, and the innermost part of the black bladder. When preserved in spirits, or in a frozen state, they soon become white and opaque, whilst if preserved in glycerine they remain half transparent; then the minute pricks become fainter, whilst the iris always retains its silvery colour.

In the breeding-season the minute pricks become more numerous, especially in the males. A row of these pricks, yellowish red in colour, stretches along the sides, corresponding in number to the vertebræ. Along the dorsal line another row of brown pricks is found. Along the anal fin, on each side of the root of the rays, is a row of black pricks, which continues behind the end of the fin in

[1] "Stripes of minute warts," Günther, Catal. vol. iii. 1861; "External papillæ of taste," Winther, Naturh. Tidsskr, 3. R., 9. B., p. 181, Kbhvn. 1874.

the shape of a short black stripe; this is the most conspicuous and durable of all the rows, and is never wanting. The caudal fin has a brownish shade; sometimes this is also the case with the anal fin, whilst all the other fins are hyaline. The iris is silver-coloured, with black pupil; the upper margin of the eye is golden, which, after death, changes to a black. The younger individuals are more sparingly pricked; the row along the anal fin is the first which shows itself, and is already visible in the young ones, with a total length of 13 millims., where all the other pricks are wanting.

In the males in full breeding almost every part of the body has a faint brownish light, although this is nowhere collected into larger dots, but is most distinct along the transverse impressions of the muscles.

C. *Habits and Distribution.*

Generation.—It is probable that no specimen lives more than one year, and after the close of the breeding-time dies without living through another spawning; consequently these fishes are really *annual vertebrates.*

The spawning-season occurs in the Christiania Fjord in the summer months. The latest date at which I have found females with ripe spawn was on August 2, 1872, although the greater number of them had then already spawned. The normal period of spawning is the end of June or the beginning of July. On the 10th and 14th of August, 1875, I found them in the middle of their breeding, although several were still not quite mature. When the spawning is finished all the specimens disappear entirely, and become apparently extinct.

The first young ones I took on August 28, 1875, when their average size was 22 millims.; a few specimens were rather larger (attaining about 30 millims.), or less (down to 13 millims.). At the same time there is not a single specimen of a greater size to be found at those places where they, in the middle of June, were found in numbers and only in a full-grown state.

A month later the median length may be estimated at 34 millims., in the end of October at 38 millims. The development proceeds tolerably even with them all; and specimens are very rarely to be found which differ to any degree from the medium size. Most of the individuals attain their full size as early as December or January, in order that, when the organs of generation begin to develop themselves in the following spring, they may acquire greater plumpness and strength in all parts of the body—a change which, as we have indicated above, chiefly takes place in the males. Amongst the thousands of specimens which I have examined during the autumn and winter, I have not found a single specimen with the slightest trace of the long teeth that characterize the mature male; and during the summer time all the males, without exception obtain these teeth.

In the young females, at the age of only four months, the ovaries may be seen through the transparent body in the form of two elongated strings, filled with clear eggs; in the spawning-season these

strings take up the greater part of the belly, without, however, as is the case in *Crystallogobius nilssonii*, reaching behind the vent along the root of the caudal fin. The number of the eggs is between 1800 and 2000.

Habits.—This species, as well as the following differs in its habits in several respects from most of the typical *Gobiidæ*. Above the compressed body the laterally placed eyes indicate that they do not live at the bottom, as is the case with the greater number of Gobies, but swim about freely. Neither do they keep themselves dispersed or in single numbers, but in large and dense shoals, where their perfect transparency, in connexion with their inferior size, enables them to avoid immediate observation. Sometimes I have taken them from the stomachs of other fishes; but by far the greatest number are brought up to the surface by the nets set out for different other fishes, especially for the sprat and the young of the common herring. These fishes are caught in the Christiania Fjord in September and so long as the fjord is free from ice—as a rule, until the beginning of the new year. In the spring and summer, when the nets are drawn for mackerel, they are also to be found, and then with the organs of generation fully developed. These nets are drawn at a depth varying from one to fifteen fathoms. An examination of the stomachs of these fishes shows that they contain chiefly pelagic copepods and the fry of mollusks in their swimming-stages; these animals principally live in the upper strata of the sea some few fathoms under the surface. The bottom consists, in most of the inner parts of the Christiania Fjord, of clay and mud, which, in the more shallow water, is covered with *Zostera*.

These fishes seem always to keep together in enormously large shoals; and when the meshes are very fine they are sometimes caught in great masses. The 30th of October 1875 (which was a particularly successful year for their development), I found in a single draught (which, besides, also brought in some young specimens of two or three species of *Gadus*, several *Pleuronectes flesus*, and *Ctenolabrus rupestris*, some *Gobii* of common species, and herrings) such large masses of them that I collected between two and three thousand specimens, whilst possibly more than double this number had already escaped through the meshes. In the same year I was not able to notice any diminution of their numbers, and they were always found in the same places; still they are not at all equally numerous every year, and they have been rather scarce both in 1876 and 1877, especially in the latter.

In the Mediterranean they must be produced in still greater numbers, as they are caught in very fine nets and sold as food. In several of the fishing-markets in the towns by the Adriatic and in Sicily Prof. G. O. Sars saw vessels filled to the brim with these fishes alone, forming a complete jelly-like mass. Kessler also mentions their use as food in Odessa.

Upon the least touch the scales fall off; and after the nets are drawn, scarcely a single specimen will have its scales complete, and the greater number will have lost almost every scale. The proportionally

large swimming-bladder, which occupies a considerable part of the belly, expands still further when the individuals are brought up to the surface, the somewhat fatigued fish not being able to compress it so as to make the specific weight of the body to decrease sufficiently to permit it again to descend under the water. The weight of the body is also diminished by the loss of the scales; consequently a great number of such individuals are driven about on the surface of the water in a still living state, till they are carried away by the stream or picked up by sea-birds and other enemies. They swim, however, not without a certain degree of rapidity.

Their enemies are almost all other fishes who occupy the same locality. Especially the different kinds of *Gadus* devour large masses; and even in the case of small specimens of *Gadus morrhua*, *G. esmarkii*, and *G. merlangus*, I have occasionally found the stomach crammed with them. When they float about in their helpless state on the surface of the water, *Gasterosteus aculeatus* and *Spinachia vulgaris* snatch large pieces out of their brittle bodies.

As mentioned above, their food consists chiefly of microscopic copepoda and other small pelagic animals. In the specimens that I have examined in the Christiania Fjord, these principally consisted of the copepods *Dias longiremis*, Lilljeb., *Temora velox*, Baird, together with the larvæ of decapods (*Hippolyte* and *Palæmon*), and mollusks in their swimming-stage (*Cardium*). The stomach contains this kind of food both in the summer and the winter.

Distribution.—Taking for granted, that the forms from Southern, Western, and Northern Europe are identical, *L. pellucidus* has a very wide distribution, although our information touching this species is at present very incomplete. In this case it is met with (possibly in certain spots only) from the western coast of Norway, about 60° N. long., down along Western Europe to the Mediterranean, in the Adriatic, and right up to the innermost parts of the Black Sea.

In Norway it is met with outside of Bergen, and in the Christiania Fjord. At the first-named place the late naturalist Mr. Stuwitz obtained four specimens in December 1834; it has, however, not since been found in this locality. In the Christiania Fjord I have found it in several places inside Doobak, chiefly amongst the islands outside Christiania; most likely it is to be found in the outer parts of the fjord also, and undoubtedly at other places along our southern coast, not mentioned here.

In Sweden it has been found by Dr. Malm in Bohuslen.

In Scotland Mr. Parnell has taken it in Solway Frith, June 1836; and in his 'Catalogue' Dr. Günther states that the British Museum also has specimens from the Frith of Forth.

In the Mediterranean it is known, through Prof. Canestrini, from the Gulf of Genoa; and Prof. G. O. Sars found it in the beginning of 1876 at most of the places visited by him—*e. g.* in Sicily, at Messina, and Syracuse—everywhere in enormous masses. In the Adriatic, whence it was already described in 1824 by Nardo, and afterwards mentioned by several authors, he found it at Trieste.

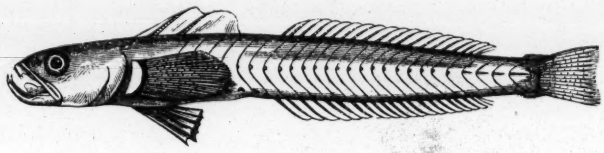
In the Black Sea it was taken in the harbour of Odessa by Kessler in 1859.

Genus CRYSTALLOGOBIUS, Gill.

Crystallogobius, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (1863).

Body transparent, elongate, strongly compressed, naked, with parallel muscular impressions. The male only dentiferous, the teeth in a single series; strong canine teeth in the lower jaw. Two separate dorsal fins, the first composed of two spines; ventral fins united, gill openings wide; pseudobranchiæ present.

Fig. 3.



Mature male of *Crystallogobius nilssoni*, in the breeding-season ½.

C. NILSSONI (Düb. & Kor.).

1844. *Gobius nilssonii*, Düb. & Kor. Kgl. Vet. Akad. Handl. 1844, p. 53, tab. 2. fig. 3 (Stockh. 1846).

1861. *Gobiosoma nilssonii*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 86 (Lond. 1861).

1863. *Crystallogobius nilssonii*, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (Philad. 1864).

1872. *Latrunculus nilssonii*, Coll. Forh. Vid. Selsk. Christ. 1872, p. 10 (Christiania, 1873).

1874. *Latrunculodes nilssonii*, Coll. Forh. Vid. Selsk. Christ. 1874, p. 151 (1875).

The intermaxillary bones in the male very prominent, short; small teeth in front of both jaws, long canine teeth in the lower jaw. The ventral fins united into a funnel, with the shorter rays towards the body. The first dorsal and the ventral fins in the female rudimentary; the ovaries project far behind the vent. Number of muscular impressions 27. The lower jaw the longer.

D^1 2, D^2 19 (20); C. 8 (9 or 10) + 15 (14) + 8 (9 or 10); A. 21; V. 6; P. 30 (31). Lin. lat. 27. Vertebr. 29. M. B. 5.

A. *Remarks on the Synonymy.*

This species was described by von Düben and Koren in the Vet. Akad. Handl. for 1844, under the name of *Gobius nilssonii*, the description having been taken from half a dozen specimens found off the Bergen coast in 1834–43, although it had earlier, during the same

year, been mentioned, but without any accurate description, and under the temporary name of *Gobius linearis*, by the same author in a letter which was published in Œfv. Kgl. Vet. Akad. Förh. May 1844. In Günther's 'Catalogue,' vol. iii. (1861) it is placed under the genus *Gobiosoma*, although the correctness of this is doubted. As early as in 1863 Prof. Gill (Proc. Acad. Nat. Sci. Philad.) established for this species a new generic name, *Crystallogobius*. Synonymous herewith is the name *Latrunculodes*, by which, in 1874, not knowing the remarks of Prof. Gill, I entered it in a treatise on the Gobioid Fishes of Norway (Forh. Vid. Selsk. Christ. 1874), and later in the same year in a paper on the Fishes of Norway (Supplementary part of the Forh. Vid. Selsk. Christ.).

Since the species was entered in the system in 1874, it has not been the subject of detailed description. Nilsson, in his 'Skandinavisk Fauna' (1855), has taken his description from that of Düben and Koren, as is also the case with the few other authors who mention the species.

The same applies to this species as to *Latrunculus pellucidus*, that the characters mentioned in the descriptions only belong to one of the sexes, in *Crystallogobius nilssonii* to the fully developed male. The female of this species, which shows a constant and remarkable difference from the male, has not hitherto been described.

In June 1875 I found the species in the Christiania Fjord in mature state, together with *Latrunculus pellucidus*, though in very much smaller numbers; and more lately I have on a few occasions collected young specimens out of the spawning-season. Although the number of specimens which at present stand at my disposal, namely 33, do not represent an unbroken series of all the different ages of both sexes, I can still give a descriptive account of their principal stages.

B. *General Description.*

The mature males have a total length of between 43 and 47 milllims.; still maturity is evidently attained in some specimens with a length of 38–40 millims. The first dorsal fin has long rays with a wide membrane; the head is thickened, with a short snout; the jaws long, and singularly bent towards each other; the canine teeth in the lower jaw high and curved; and the intermaxillary bones form on each side a strong projection, almost in the form of a nail. A little more pointed is the head, and the body on the whole is more slender, in the males which have not reached a total length of 70 millims; neither have the jaws nor the teeth in this case attained their full length, though the testicles are filled with ripe milt.

The young males, whose testicles do not yet contain ripe milt, although their total length is only a trifle less than the smallest of the mature specimens, namely 36 millims., have the body thin and slender, the head pointed, almost as in the females; the teeth, however, are already visible, and all the fins normally developed.

The mature females, with the eggs ready for spawning, are considerably smaller, and of a more slender construction, than the

males. Although the total length is almost the same as in many of the mature males (36–37 millims., in a single specimen 39 millims.), their body is so slender and their weight so inconsiderable, that two full-grown females, with the ovaries filled with ripe eggs, were not able to weigh down one large full-grown male. The head is pointed, with short jaws, which are straight and perfectly toothless, and are wanting the males' prominent projection on the intermaxillary bone. The first dorsal and the ventral fins are rudimentary (at a superficial glance they appear to be entirely wanting); the pectoral fins are certainly developed, but very short. The ovaries project far behind the vent on each side of the anal fin.

The young females, with a total length of 30–33 millims., and with the ovaries filled with unripe eggs, have the body very slender and pointed: as in the old female the jaws are toothless, the first dorsal and the ventral fins apparently wanting.

The young during growth.—The few young with a total length of about 25 millims. that have been at my disposal have all been males. This is shown by the first traces of teeth, by the want of the long ovaries, as well as by the presence of all the fins; certainly the first dorsal and the ventrals are short, but never wanting or even rudimentary. These fins may already be seen in the young with a total length of 21 millims., the smallest specimen I have found; in this one, however, there was not yet any trace of the pectorals.

It may therefore be supposed that in the males the first dorsal and the ventral fins spring forth at a very early age, whilst the females never have these fins developed; the pectorals, on the other hand, are present in both sexes (although in the female in a less-developed state), but are always late in appearance.

As compared with *Latr. pellucidus*, the difference in the exterior between the sexes in the present species appears in several ways already at a very early period, whilst this difference in *Latr. pellucidus*, as stated above, only becomes apparent in mature specimens.

The construction of the body is thin and elongated, very compressed, and does not, as is the case in *Latr. pellucidus*, practically increase in plumpness in the spawning-season.

In a full-grown specimen, ready for spawning, with a total length of 46 millims. (caudal included), the length of the head is about 10 millims, and is contained $4\frac{1}{2}$ times in the total length. The greatest height ($5\frac{1}{2}$ millims.) continues almost unaltered from the occiput to about a head's length from the caudal fin, and is contained $8\frac{1}{2}$ times in the total. The vent, on the posterior margin of which there is a small papilla, is situated halfway between the snout and the root of the caudal, and in some individuals projects in the form of a short tube.

In the female, which, as stated above, is considerably smaller than the male, the head is somewhat more pointed. In a specimen with the eggs ripe the head is contained about 5 times or a little more in the total length.

The diameter of the eye is one fourth of the length of the head.

The eyes are situated perfectly laterally, so that the lower margins do not seem to project more than the upper. The interorbital space is, in the female and young specimens, not broader than the diameter of the eye, in the full-grown male a little larger. The branchiostegals are 7 in number; the gill-openings are wide.

The mouth is oblique, with the lower jaw the longer. In the female and the young males the lower jaw is almost straight, or only faintly bent, and the intermaxillary bones are quite even in their outer margin; but in the full-grown male the jaws receive a special development during the spawning-season. The intermaxillary bones then become broad, and form on each side of their margin a distinct projection, almost in the form of a nail; at the same time that the teeth reach their full development the lower jaw becomes long and strongly curved upwards, and when the mouth is shut it reaches a little in front of the intermaxillary bones, the projecting nail of which encloses the almost angularly curved upper part of the lower jaw. The point of the latter jaw is square, and, as is the case with the intermaxillary bones, in the male dentiferous. In these old males the gape reaches backwards to the posterior margin of the eye, whilst in the female and the young males it scarcely reaches beyond the middle of the eye. The length of the lower jaw in proportion to the total length is in the old males as 1:7⅜, in the female as 1:10¼.

The number of *vertebræ* is 29.

The teeth.—Whilst during its immature state *Latr. pellucidus* has a construction of the teeth common to both sexes, which continues permanent in the female, whilst the male towards the spawning-season in a comparatively short time changes these teeth for another set of a totally different construction, this is not the case with *Crystallogobius nilssonii*. First, the female is perfectly toothless all her life; secondly, the teeth of the male, which are composed of both small and acute teeth and long canine teeth, are developed very early, and all reach their full size during the spawning-season.

The exact time when the teeth make their appearance in the young is probably when they are about two months old. A young one, with a total length of 21 millims., and perhaps about one month and a half old, had no traces of teeth.

In the young males, which have reached a total length of 26–28 millims., the teeth begin to show themselves in the intermaxillary bones and the point of the lower jaw; at this period all the teeth are about equal in size.

In the male during the spawning-season, when the teeth have reached their full size, the projecting intermaxillary bones have on their upper and prominent portion a single row of closely placed, small, acute, and curved teeth, 13–14 in number, on each side (see fig. 4); on the lower square margin one or two teeth directed straight downwards or backwards are found. The maxillary bones are without teeth, as well as the vomer. In old males the outer part of the lower jaw runs out in a long upward curve, which at

its point is dentigerous, while otherwise the jaw has no teeth; the innermost part of this jaw forms a sharp edge, which, as the jaws meet one another, places itself inside the corresponding part of the upper jaw, whilst the point of the lower jaw, as mentioned above, is encompassed by the outward-bent intermaxillary bones. The point of the lower jaw is square and broad, and has a remarkable similarity to the jaw of a carnivorous animal. On each side of the square point is found a long and curved canine tooth, and between them a row of, together, eight small and acute teeth of the same construction as those in the intermaxillary bones.

Fig. 4.



Snout of mature male of *Crystallogobius nillsoni* in the breeding-season, strongly magnified.

The female must be pronounced toothless, as such teeth as can be found are partly irregular and partly perfectly microscopical. In a fresh or soft specimen it is scarcely possible to find even a trace of teeth; but in a dried specimen a couple of very minute and straight isolated teeth may be seen, with the aid of the microscope, on the middle of the lower jaw; these, however, are sometimes entirely wanting on one side. In a full-grown female the length of these teeth is about $\frac{1}{20}$ to $\frac{1}{15}$ of a millim.

The fins.—The first dorsal fin, which has two rays, becomes only fully developed in the mature or the nearly full-grown male, but is much shorter in the young (not half-grown) male, and rudimentary in the female. In the males it has strong but not stiff rays, which are placed at comparatively large intervals, and considerably sloped backwards, and have the point almost bent downwards, the membrane, which begins already a little in front of the first, continuing behind the last, and running along the dorsal line towards the beginning of the second dorsal fin; in some specimens it even connects both fins completely. The first ray is a little shorter than the second, the length of which does not much exceed the greatest height of the body. In the young males the rays are shorter, and the membrane between them incomplete. In the female they are shortened to such an extent that they can only be discovered by very minute examination; sometimes only one ray seems to be developed. In the female the length of the rays seems never to exceed the length of the eye, and is generally shorter, sometimes having only the length of the crystalline lens.

The second dorsal has nineteen, sometimes twenty rays, the last of which is a double ray. By means of a strong membrane the rays are directed strongly backwards, and appear, therefore, lower than they really are; they are all even, and have a length equal to half the height of the body. The posterior rays are not elongated even in the male, and reach to an orbital diameter's distance from the root of the caudal fin. All the rays are indistinctly articulated, and undivided; and it is only by the aid of the microscope that in some individuals a trace may be seen of an indistinct division at the point. Still shorter and more delicate are the rays of the female, their length being scarcely equal to an orbital diameter.

The caudal fin has fifteen articulated middle rays, sometimes only fourteen; also on each side eight, sometimes nine or ten short connecting rays, which are widely divergent in their points, especially the foremost, so that they can even point forwards, giving the root of the fin an increased breadth. The middle rays are articulated, and all of them divided from about the middle (except the two outermost on each side); but neither of the branches is further divided. The first ray is short and thin, and the articulation is not very plain; the fourth and fifth rays are the longest, while the middle rays again become shorter. One consequence of this is, that the fin becomes more or less emarginate, with rounded edges; it is rather short, and scarcely attains the greatest height of the body.

The anal fin counts twenty-one rays, the hinder of which is a double ray. It takes up nearly the whole space between the vent and the caudal, and agrees very much in its form and construction with the second dorsal. It is only by very favourable light that any trace of articulation in the points of the rays can be discovered, and not in all of them. The last ray reaches almost to the root of the caudal; in some undamaged individuals it is even connected with the last-named fin by a membrane, whilst this membrane is wanting in others.

The pectoral fin counts thirty, sometimes thirty-one rays. Twelve to fourteen of the middle rays are singly divided from about the middle; the remainder are undivided. All are finely articulated. The form of the fin is broadly rounded. The pectoral fins are not very long; in mature males they have about two thirds of the head's length, and do not reach to the vent. In young males and in the female they are much shorter, although they are never rudimentary.

The ventral fins, which are attached close to the root of the pectoral fins, and just behind the lower end of the gill-openings, are well developed in the mature male, shorter in the younger male, and rudimentary in the female.

When present they form a closed and deep funnel, which is square-cut behind, and, contrary to what is found in the other *Gobiidæ*, have their innermost rays (nearest to the belly) shorter than the outer ones. The number of the rays is six in each fin: of these the first is divided from about the middle; the remainder are more slender, undivided, and not articulated. On the whole, the faint

tendency to division of the rays is characteristic of this species as compared with *Latrunculus pellucidus*, in which division of the rays takes place especially in the ventral fins. The funnel is comparatively short; when closed it is, even in the male, removed from the vent to a distance about equal to its own length. In young males the ventral fins are very small, and their funnel-like shape is almost imperceptible, the connecting membrane being incomplete.

In the female the ventral fins are completely rudimentary, being only present as a couple of two disconnected and very short rays scarcely the diameter of the eye in length.

The *mucous glands*, which in *L. pellucidus* form so extensive a system, seem to be almost entirely wanting in *Crystallogobius nilssonii*; in none of the specimens which I have examined have I been able, with certainty, to find a single complete row of such glands, either on the head or on any other part of the body.

The skin.—No trace of scales has hitherto been detected in any of the specimens examined. As is the case in *L. pellucidus*, the whole side of the body shows a row of transverse impressions; when examined in the microscope, no trace is found of follicles to which lost scales may have been attached; and it is therefore scarcely to be doubted that the body is altogether naked in this species. The number of these muscular impressions is twenty-seven, twenty of which have their place behind the vent; they bend together into the form of an angle in the middle line of the body, and denote exactly the number and size of the vertebræ. An actual lateral line, with open pores, does not exist.

The colour.—As is the case in *L. pellucidus*, the body during life is transparent, with a faint bluish tinge, thereby enabling the vertebræ, the apple of the eye, &c. easily to be seen. The coloration of the skin is very faint, and does not vary in this respect to any degree, even during the spawning-season. The eyes are strongly coloured, their upper edge being of a shining metallic lustre (black after death); the iris is silvery. A well-defined blackish spot is found at the point of the lower jaw; another black stripe stretches along the throat towards the ventral fins. At the root of each ray in the anal and the caudal fin there is a black point; these together form a continuous and distinct row, which is present in both sexes and at all ages; along the dorsal fin there is found a somewhat fainter row of brownish points, which is indistinct, or nearly wanting, in the female. Moreover all the rays are covered with minute blackish points. The body itself is almost unspotted (whitish when preserved in spirits), except on the sides of the belly, where a row of fine brownish spots stretches itself; these spots are largest and most distinct in the breeding female, their number being 3–5 on each side.

C. *Habits and Distribution.*

Generation.—With regard to the time of breeding and its duration, nothing conclusive can be said at present on account of the very

few materials at my disposal. In all probability *Cryst. nilssonii* reaches (as is the case with *Latr. pellucidus*) maturity at the age of one year, after which it disappears. The spawning-season is probably the same as in the other species, consequently during the summer months; on the whole, however, it appears to have a somewhat longer duration.

From the researches I have been able to make among collected specimens, compared with those preserved in the Museum of the University, it appears that the spawning probably begins in some individuals as early as in March or April; perhaps the greater number attain their maturity in the last part of June; whilst in other specimens the spawning does not take place before the beginning of August, or perhaps later. After the conclusion of the spawning the specimens no doubt perish, their life having thus lasted only one year.

Habits.—In its habits this fish probably agrees perfectly with *Latr. pellucidus*. The extraordinarily compressed body denotes that it swims freely about in rather deep water, and not, like most of the true *Gobii*, resting itself at the bottom; in fact this would be almost impossible, on account of the peculiar construction of the ventrals of the male, and, in the case of the female, from its entire want of these fins. Most of the specimens mentioned by other authors have been taken in the dredge at a depth of 30 fathoms. Von Düben and Koren state that some of their specimens crept into empty tubes of *Chætopterus norvegicus*, in which, however, they had only taken refuge whilst the dredging was going on.

In the Christiania Fjord I have taken these fishes, together with *Latr. pellucidus* in nets set out for mackerel, *Clupea sprattus*, and young of *Cl. harengus*. The nets bring them to the surface in the same manner as is the case with *L. pellucidus*. As a rule they lose the capability of again descending, from the swimming-bladder becoming strongly distended when they reach the upper strata of the water. This fish is met with in far less numbers than the last-named species. In the same manner it is taken as food by other fishes; and I have taken it from the stomach of small young examples of *Gadus morrhua*.

Food.—Upon examining a number of stomachs of individuals taken in the month of June, I have found them filled with digested remains of Entomostraca, without, however, being able to recognize any species of them. Probably they were Calanidæ, or, perhaps, pelagic Copepoda of the same species as are found in *Latr. pellucidus*.

Distribution.—Besides being found in Norway, *Cr. nilssonii* has been taken more lately on the coast of Bohuslen (Sweden); and perhaps it also occurs on other parts of the coast of Northern Europe. In Norway its habitat extends from the Christiania Fjord along the western coast, nearly to the Trondhjems Fjord, in about 63° N. latitude.

The most northern point at which it has been found was at Christiansund, in July 1843, by v. Düben, and also about the same

time at Askwold, in Sond-fjord, by Mr. Christie—in all only six specimens.

In the neighbourhood of Bergen five specimens were taken by Mr. Stuwitz, December 1834; in 1850 one specimen was found at Bongeströmmen, near the town: in all six specimens.

One specimen was dredged by Prof. G. O. Sars at Espevar, in the mouth of the Hardanger Fjord in August 1873.

In the mouth of the Christiania Fjord two specimens were dredged in two different localities about 1860; finally, in the years 1875–77 I took twenty-eight specimens in nets between the islands off Christiania.

In Sweden two specimens were found (in a dead state) in Bohuslen by Dr. Malm, in June 1877.

March 19, 1878.

Arthur Grote, Esq., V.P., in the Chair.

Mr. Sclater exhibited the type specimen of *Dicrurus marginatus* of Blyth (Ibis, 1865, p. 46), belonging to the Derby Museum, Liverpool, and pointed out its identity with *Muscipipra vetula* (Licht.) of Southern Brazil, of the family Tyrannidæ.

The following papers were read:—

1. Contributions to the Ornithology of the Philippines.—No. VI. On the Collection made by Mr. A. H. Everett in the Island of Leyte. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received February 25, 1878.]

The island of Leyte is about 130 miles long, and has an average breadth of 35 miles. It lies S.S.W. of Samar, its northern part lying in close contiguity to Samar. Zebu is situated to the west, and Dinagat to the south-east, while Mindanao is due south. Water-channels of unimportant breadth separate Leyte from these other islands. A peculiar ornis is therefore not to be expected, and Mr. Everett's researches have not made known any special feature. That gentleman, however, procured all the birds of which I propose to give a list at Amparo (on the south-west coast of Leyte) and in its vicinity. But Mr. Everett writes that he does not believe the collection he sends at all adequately represents the avifauna of Leyte, and he hopes to revisit it and explore the mountains in the centre and south of the island.

The most interesting species is *Buceros semigaleatus*, a purely local form, distinguishable from the two previously known Philippine

species by the contour of the casque. *Thriponax pectoralis* is another species, the deviation of which from *T. javensis* of Luzon is probably owing to isolation. In *Arachnothera flammifera* Mr. Everett has added another Malayan genus to the Philippine area.

1. CACATUA HÆMATUROPYGIA (1).

[Amparo, ♂ ♀, July.]

2. TANYGNATHUS LUZONENSIS (3).

[S. Leyte, ♂, September.]

3. LORICULUS HARTLAUBI (7)?

[Amparo, ♂ ♀, July.]

I provisionally identify a series of nine examples of the South-Leyte *Loriculus* with *L. hartlaubi* until further research establishes the permanency of the characters whereby these Leyte birds differ from those of North Mindanao and Dinagat. Five individuals are examples of the male bird in apparently adult plumage. They differ from true *L. hartlaubi* in having a much smaller orange-red pectoral plastron, and in its not running up to the naked chin, but stopping short some way below, so that the upper throat is uniform green. Above, the back is green, and not golden, nor is that of the female. The dimensions are equal.

4. ASTUR TRIVIRGATUS (11).

[Amparo, ♀, July.]

In Mr. J. H. Gurney's opinion this Leyte example is in immature plumage, and probably belongs to a male.

5. SPILORNIS HOLOSPILUS (16).

[S. Leyte, ♂ ♀, September.]

6. HALIASTUR INTERMEDIUS (17).

[S. Leyte, ♂ ♀, September.]

7. THRIPONAX PECTORALIS, n. sp.

[S. Leyte, ♂ ♀, September.]

Like *T. javensis*, but differs in having the feathers of the chin, throat, sides of head and neck white, broadly centred with a median black stripe, and in the fulvous-white colouring of the abdomen covering the breast, each pectoral plume being centred with black.

8. MEROPS PHILIPPINUS (35).

[S. Leyte, ♂ ♀, September.]

9. MEROPS BICOLOR (36).

[S. Leyte, ♂ ♀, September.]

Two examples in mature plumage, two immature; the chestnut head and back in the latter mixed with green, and the middle pair of rectrices not fully developed.

10. Eurystomus orientalis (37).

[Amparo, ♂ ♀, August.]

11. Alcedo bengalensis (38).

[S. Leyte, ♂ ♀, October.]

12. Ceyx argentata.

Ceyx argentata, Tweeddale, Ann. & Mag. N. H. ser. 4, vol. xx. p. 533.

[S. Leyte, ♂, October.]

13. Entomobia gularis (44).

[Amparo, ♂, August; S. Leyte, September.]

14. Sauropatis chloris (47).

[Amparo, ♂ ♀, August.]

15. Pelargopsis gigantea.

Pelargopsis gigantea, Walden, P. Z. S. 1877, p. 541.

[Amparo, ♂ ♀, July; S. Leyte, ♂ ♀, September and October.]

Ten examples, all of which belong to the smaller North-Mindanao and Dinagat race, which I have hitherto provisionally referred to *P. gigantea*.

16. Centrococcyx viridis (64).

[S. Leyte, ♂ ♀, October: iris brown. *b*. ♂, September: iris yellowish brown; bill black; legs steel-grey.]

17. Buceros semigaleatus.

Buceros semigaleatus; Tweeddale, P. Z. S. 1878, p. 277.

18. Penelopides affinis.

Penelopides affinis, Tweeddale, Ann. & Mag. N. H. ser. 4, vol. xx. p. 534; P. Z. S. 1877, pp. 824, 825 (fig. 1)[1].

[Amparo, ♂ ♀, July; S. Leyte, ♂ ♀, September and October, ♀ juv.[2]: iris raw sienna-brown; bill greenish brown; mandible greenish; legs dark greenish grey. ♀. Iris in living bird rich dark burnt-sienna-orange.]

The new rectrices in both sexes of this species are pure white, and not pale rufous, the apices always remaining black. In one example (♀) the two middle rectrices have a dark rufous terminal band, black being indicated where this band meets the paler rufous of the basal portion. In a young male this also occurs.

19. Lanius nasutus (70).

[S. Leyte, ♂ ♀, September and October.]

[1] The passage in which I differentiate *P. affinis* from *P. panini* and *P. manillæ* (*l. c.*) should read "by the absence of the channelling on the lateral plates of the maxilla."

[2] Marked ♂ by collector, but in complete black plumage.

20. Lanius lucionensis (72).

[S. Leyte, ♂ ♀, September.]

The males are in adult dress, with pearl-grey foreheads. The female has all the gular and pectoral plumage narrowly edged with brown, as well as the feathers of the flanks and thighs. The entire upper plumage is uniform liver-brown, without a trace of grey on the forehead.

21. Artamus leucorynus (73).

[Amparo, ♂, August; S. Leyte, ♀, October.]

22. Lalage dominica (76).

[Amparo, ♂, July.]

23. Cyornis philippinensis.

Cyornis philippinensis, Sharpe, Tr. L. S. 2nd series, Zool. i. p. 325.

[Amparo, ♂, July.]

24. Hirundo javanica.

Hirundo javanica, Sparrman, Mus. Carls.

[S. Leyte, ♂, September, ♂ juv., October.]

25. Broderipus acrorhynchus (90).

[Amparo, ♀, July; S. Leyte, ♂ ♀, September.]

26. Mixornis capitalis.

Mixornis capitalis, Tweeddale, P. Z. S. 1878, p. 110, pl. vii. fig. 2.

[S. Leyte, ♀, October: iris white.]

27. Ixus goiavier (99).

[Amparo, ♀, July; S. Leyte, ♂ ♀, September.]

28. Hypsipetes philippinensis (102).

[S. Leyte, ♂, September.]

29. Monticola solitarius (103).

[S. Leyte, ♂ ♀, October.]

Three examples are in dull plumage, the feathers, especially on lower surface, broadly margined with brown; above, a bluish tinge. These are marked female by the collector. A fourth example (marked ♀) is passing over from this stage, the blue tinge above being much more marked, while most of the abdominal plumage and the under tail-coverts are rich chestnut. A fifth example (marked ♂) is in nearly full blue and dark rich chestnut plumage.

30. Copsychus mindanensis (106).

[S. Leyte, ♂ ♀, September.]

31. Phylloscopus borealis.

Phyllopneuste borealis, Blasius, Naumannia, 1858, p. 313.

[S. Leyte, ♂, October.]

32. Calobates melanope (115).

[S. Leyte, ♀, September.]

33. Myzanthe pygmæa (121).

[S. Leyte, ♂, October: iris chocolate.]

34. Arachnothera flammifera, n. sp.

[S. Leyte, ♂, September: iris salmon-red; bill black; legs dark lead-grey.]

Above uniform rich olive-green; chin, throat, sides of head, and neck pale grey; upper breast pale grey, tinged with yellow; lower breast a purer pale yellow; abdomen, flanks, ventral region, and under tail-coverts deep yellow; wing-lining silky pale grey, almost white; pectoral tufts (which measure some three quarters of an inch long) bright vermilion-red; quills brown, margined with olive; rectrices brown, all but the middle pair boldly tipped on the inner webs with white.

Wing 2·45, tail 1·75, culmen 1·25, tarsus 0·62.

The discovery of this species by Mr. Everett adds another characteristic Malayan genus to the Philippine avifauna.

35. Nectarophila sperata (122).

[S. Leyte, ♂, September.]

36. Arachnechthra jugularis (123).

[Amparo, ♂ ♀, July, August.]

37. Corvus philippinus (125).

[S. Leyte, ♂ ♀, July.]

38. Calornis panayensis (128).

[Amparo, ♂, August; S. Leyte, ♂ ♀, September and October, ♂, juv., September: iris brownish ochre-yellow.]

The young bird is in brown and striated plumage.

39. Sarcops calvus (129).

[Amparo, ♂ ♀, July.]

These two examples have the whole back, from the nape to the uropygium, and also the scapulars dark brown. This is also the case in my Zebu series, and in some individuals from South Negros. In one Negros example the back is dark brown, many of the feathers being fringed with various shades of grey. In another the amount of grey and brown on the back is about equal; and it would seem that the grey colouring of the back belongs to the fully adult bird, and that the nape, uropygium, and upper tail-coverts assume the full grey colouring of the adult before the dorsal plumage commences to turn grey; the whole of the upper plumage is brown at the base, the tips alone changing to grey.

40. Munia jagori (132).

[Amparo, ♀, July; S. Leyte, ♂, September.]

41. PHABOTRERON BREVIROSTRIS.

Phabotreron brevirostris, Tweeddale, P. Z. S. 1877, p. 549.

[Amparo, ♀, July.]

42. CARPOPHAGA ÆNEA (141).

[Amparo, ♂ ♀, July.]

43. TURTUR DUSSUMIERI (147).

[Amparo, ♂ ♀.]

44. CHARADRIUS FULVUS (159).

[S. Leyte, ♂ ♀, September and October.]
In non-breeding plumage.

45. EUDROMIAS GEOFFROYI (161).

[S. Leyte, ♂ ♀, September and October.]

46. EUDROMIAS MONGOLICUS (163).

[S. Leyte, ♀, September.]

47. ÆGIALITES DUBIUS (162).

[S. Leyte, ♀ ♂, September and October.]
All the examples, nine in number, are of birds in full breeding-plumage.

48. ÆGIALITES PERONII.

Charadrius peronii (Temm.); Schlegel, Mus. Pays-Bas, *Coraces*, p. 33; Walden, Tr. Z. S. viii. p. 90. no. 142, pl. x. f. 2.

[S. Leyte, ♀, October.]
In immature plumage; first primary only two thirds grown; sides of breast and narrow connecting band brown, mixed with rufous; broad frontal patch pure white, bounded posteriorly by a narrow brown band; crown and occiput rufous brown; tarsus one inch.

49. MELANOPELARGUS EPISCOPUS.

[Amparo, ♂, July.]
In full plumage.

50. GALLINULA CHLOROPUS (169).

[Amparo, ♂ ♀, July.]

51. ORTYGOMETRA CINEREA (172).

[Amparo, ♂ ♀, July; S. Leyte, ♂, September.]

52. PORZANA FUSCA (174).

[S. Leyte, ♂, September: iris brilliant red; orbital ring crimson; bill olive-green, culmen black; legs light dull carmine.]
A single example, which belongs to the small race, *i. e.* true *P. fusca*, and not to *P. erythrothorax*.

53. Rallina euryzonoides.

Gallinula euryzonoides, Lafr. Rev. Zool. 1845, p. 368.

[Amparo, ♂ ♀, July and August; S. Leyte, ♂ ♀, September.]

54. Amaurornis olivacea (176).

[S. Leyte, ♂ ♀, July.]

55. Hypotænidia torquata (177).

[Amparo, ♂, July; S. Leyte, ♀, July.]

The female example differs from every other individual of this Philippine Rail I have examined in having the broad pectoral band coloured like the back.

56. Hypotænidia striata (179).

[Amparo, ♂ ♀, July; S. Leyte, ♂ ♀, September. ♂ juv., September, bill purple brown, the culmen dark brown.]

57. Totanus incanus.

Scolopax incana, Gm. S. N. i. p. 658.

[S. Leyte, ♀, October: iris dark brown; bill dark brown, nearly black; legs light greenish ochre.]

58. Tringoides hypoleucus (183).

[S. Leyte, ♀, September.]

59. Gallinago scolopacina (187).

[S. Leyte, ♂ ♀, September.]

60. Gallinago megala (188).

[S. Leyte, ♀, September.]

61. Rhynchæa capensis (189).

[S. Leyte, ♂, September.]

62. Ardetta cinnamomea (192).

[Amparo, ♂, July; S. Leyte, ♂ ♀, September.]

63. Herodias garzetta (195).

[S. Leyte, ♀, September: iris light yellow; orbital skin yellowish, clouded with dark grey; bill black, base of mandible whitish; legs black; feet greyish green; upper surface of toes tinged with purplish.]

64. Butorides javanica (197).

[Amparo, ♂, July; S. Leyte, September.]

One example in full, another in immature plumage.

65. Nycticorax manillensis (198).

[Amparo, ♀, July; S. Leyte, ♂, September: iris golden-yellow; orbital skin yellow-green; bill black; legs pale ochreous white but brown in front and on upper surface of toes.]

The male is in full breeding-plumage. The lengthened occipital

plumes are black throughout their length, and not only at their tips, as described by Vigors and figured by Fraser.

66. STERNA BERGII.

Sterna bergii, Licht. Verz. d. Doubl. Mus. Berl. p. 80.

[S. Leyte, ♂, October.]

67. DENDROCYGNA VAGANS (203).

[Amparo, ♂ ♀, July; S. Leyte, ♂, September.]

2. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. VIII. On the Birds of the Sandwich Islands. By P. L. SCLATER, M.A., Ph.D., F.R.S.

[Received February 26, 1878.]

The 'Challenger' arrived in Hilo Bay, Owhyhee, on the 14th of August, 1875, and left on the 19th of the same month.

The skins of birds collected were 24 in number, belonging to 13 species. They were all obtained "within eight miles of the town."

The collection, although small, and containing nothing absolutely new except a single species of *Anas*, is of interest, as it enables us to record the actual island of the Sandwich group upon which the species contained in it were found, and as including an example of the little-known *Buteo solitarius* of Peale.

The best account of the avifauna of the Sandwich-Island group, which is still very imperfectly known to us, is that given by Dole in 1869[1]. On this I have commented at some length in 'The Ibis' for 1871[2], and given my views on the subject pretty fully. Lately M. Oustalet has described a most remarkable new form[3] from the same group; but I am not aware of any other more recent contributions to this subject[4].

1. CHASIEMPIS SANDVICENSIS.

Sandwich Flycatcher, Lath. Syn. ii. p. 343, undè

Muscicapa sandvicensis, Gm. S. N. i. p. 945.

Chasiempis sandvicensis, Cab. Wiegm. Arch. 1847, i. p. 208.

Cnipolegus, sp. 1238, Scl. Cat. A. B. p. 203; vide P. Z. S. 1873, p. 555.

No. 528. Hilo, Owhyhee. ♀.
529. „ „ „ }

"Flycatcher: eyes black; stomachs contained insects."—*J. M.*

[1] "Synopsis of the Birds hitherto described from the Hawaiian Islands. By S. B. Dole," Proc. Boston Soc. N. H. xii. p. 294.

[2] "Remarks on the Avifauna of the Sandwich Islands. By P. L. Sclater," Ibis, 1871, p. 356.

[3] *Loxioides bailloni*: vide Bull. Soc. Phil. de Paris, 7me sér. t. i. p. 99.

[4] Dr. Pucheran's somewhat peculiar views on the avifauna of the Sandwich Islands will be found explained in the Procès-Verbaux Soc. Phil. de Paris, 1858, p. 85.

2. PHÆORNIS OBSCURA.

Dusky Flycatcher, Lath. Syn. vol. ii. pt. i. p. 344, undè
Muscicapa obscura, Gm. S. N. i. p. 945.
Tænioptera obscura, Cassin, B. U.S. Expl. Exp. Atlas, pl. ix. fig. 3.
Phæornis obscura, Scl. Ibis, 1859, p. 327, et 1871, p. 360.

No. 534. Hilo, Owhyhee. ♂.
535. „ „ ♀.
536. „ „ „
537. „ „ „
} Hilo.

"Eyes brown; bill and feet black."—*J. M.*

3. MOHOA NOBILIS.

Gracula nobilis, Merrem, Av. Descr. et Ic. p. 8, pl ii.
Mohoa nobilis, Cass. Pr. Ac. Sc. Phil. vii. p. 440.
Yellow-tufted Bee-eater, Lath. Syn. i. p. 683, undè
Merops niger, Gm. S. N. i. p. 465.

No. 524. Male. Hilo.
"Eyes black; stomach contained fruit and insects."—*J. M.*

4. PSITTIROSTRA PSITTACEA.

Parrot-billed Grosbeak, Lath. Syn. ii. p. 108. pl. 42, undè
Loxia psittacea, Gm. S. N. i. p. 844.
Psittirostra psittacea, Sw. Class. B. ii. p. 295.

538. Male. Hilo.
545. Male. Hilo.
"Eyes red; stomach contained fruit."—*J. M.*
As I have already stated (Ibis, 1871, p. 360), this bird has, in my opinion, no relationship to the Fringillidæ, but is merely an exaggerated form of the same type as *Hemignathus* and its allied genera.

5. DREPANIS COCCINEA (Merrem).

Mellisuga coccinea, Merrem, Av. Descr. et Ic. p. 14, pl. iv. (1786).
Drepanis coccinea, Cassin, Zool. U.S. Expl. Exp. p. 177.

521. Female adult.
522. Young female.
523. „ „
} Hilo.

"Eyes red; bill and legs orange; stomach contained insects and seeds."—*J. M.*

6. DREPANIS SANGUINEA (Gm.).

Certhia sanguinea, Gm. S. N. i. p. 479.
Drepanis sanguinea, Bp. Consp. i. p. 404.

530. Female. Hilo.

7. DREPANIS FLAVA, Bloxham.

Drepanis flava, Bloxh. Voy. Blonde, p. 249 ; Dole, Proc. Boston Soc. N. H. xii. p. 298.

525. Male.
526. Male.
527. Female.
533. Female.
} Hilo, Owhyhee.

"Eyes black ; stomachs had seeds and insects."—*J. M.*

The females are much less yellowish than the males, especially below.

8. MUNIA NISORIA (Temm.); Walden, Trans. Zool. Soc. viii. p. 73.

543. Male. "Sparrow, introduced; native who shot it said he had never seen one before."—*J. M.*

An imperfect skin of this species (or of the nearly allied *M. punctularia*), no doubt introduced.

Prof. Baird a short time ago sent me a skin of a young or female of another Eastern Finch from the Sandwich Islands (probably *Munia malabarica*) for determination; also without doubt introduced.

9. OTUS BRACHYOTUS (Forster).

Strix sandwichensis, Bloxam, Voy. Blonde, p. 250.

Asio galapagoensis, Cassin, Mamm. et Orn. U.S. Expl. Exp. p. 207.

Asio accipitrinus, Sharpe, Cat. B. ii. p. 234.

544. "Male ; eyes yellow ; brought on board alive."—*J. M.*

10. BUTEO SOLITARIUS.

Buteo solitarius, Peale, Zool. U.S. Expl. Exp. Birds, p. 62 (1848).

Pandion solitarius, Cassin, Mamm. & Orn. U.S. Expl. Exp. p. 97, Atlas, pl. iv.

Polioaëtus solitarius, Sharpe, Cat. B. i. p. 452.

No. 540. Female.

"Eyes brown; cere and legs yellow ; bill black."—*J. M.*

Mr. J. H. Gurney has kindly examined this interesting bird for me (of which two specimens were obtained, but one of them was subsequently lost), and supplied me with the following notes :—

"The female Buzzard brought from Owhyhee by the 'Challenger' Expedition (No. 540 in that collection) appears to be of the same species, though in a different stage of plumage, as the previously unique specimen from the same island, which is preserved in the Museum of the Academy of Natural Sciences at Philadelphia, and which was described by Peale, in the first edition of the 'Zoology of the United-States Exploring Expedition,' published in 1848, under the name of *Buteo solitarius*.

"In the subsequent edition of this work, published in 1858, and edited by the late Mr. Cassin, the generic name of *Buteo*, as applied to this species, was dropped, and that of *Pandion* substituted, with the following remark :—'This bird is strictly a member of a subgenus

of the generic group *Pandion* designated *Polioaëtus* by Dr. Kaup.' (*Vide op. cit.* p. 98.)

"Mr. Ridgway, on the contrary, after an examination of the type specimen, wrote to me that he considered it 'a Buteonine form differing from the true *Buteones* only ..... in the system of coloration, which reminds us somewhat of *Milvago chimachima*.'

"In the specimen brought home in the 'Challenger' there is much less resemblance to the coloration of *M. chimachima*, and nothing, in my opinion, to justify the removal of this species from the genus *Buteo*.

"The following is a comparison of the measurements of the Challenger example with those of the type specimen as given by Mr. Cassin in the work to which I have referred:—

	Type specimen (sex unknown). inches.	'Challenger' specimen (female). inches.
Total length of skin	17 (above)	17·7
Wing.....	12	12
Tail	7·5	7·2
Bill from gape	1·5	1·5
Tarsus	2·75	2·8
Hind toe and claw	1·75	2·2
Middle toe s. u.	....	1·7
Claw of ditto.....	....	0·8
Culmen (exclusive of cere) ..	....	1·1
Cere	....	0·4

"Mr. Cassin describes the type specimen as having 'the third, fourth, and fifth quills longest and nearly equal,' which agrees with the 'Challenger' specimen, as does his description under the head of 'form' generally; but I think that, in speaking of the toes as having 'their under surfaces strongly corrugated or pustulated, claws very large, long, and curved,' he uses rather stronger language than is strictly applicable to the 'Challenger' specimen, though in this the under surface of the feet is certainly somewhat corrugated and roughened, and the claws are slightly longer than in *Buteo vulgaris* or in *Buteo desertorum*.

"As regards the difference of coloration in the two specimens, Mr. Cassin describes the type as having the 'head and entire underparts and upper tail-coverts yellowish white, all the feathers being pure white at their bases and widely terminated with pale yellowish, more distinct on the breast and tibiæ.'

"In the 'Challenger' bird the upper part of the head is dark wood-brown like the mantle, except that some of the feathers, especially on the crown and forehead, are partially edged with yellowish white; on the sides of the head these white edgings are more conspicuous; the throat is white; the breast, abdomen, under tail-coverts, flanks, and wing-linings are white, slightly tinged with buff, especially on the tibiæ, and more or less mingled with wood-brown throughout, except on the lower abdomen and tibiæ, the brown pre-

dominating over the buffy-white on the flanks, and almost entirely covering the sides of the breast.

"Mr. Cassin further describes the type specimen as having the 'occiput and neck behind with oblong longitudinal spots of umber-brown, which is the colour also of all the upper surface of the body, wings, and tail; shafts of quills reddish chestnut on their upper surface, white beneath; inner webs of quills widely edged with white; tail beneath silky-white tinged with yellowish.'

"The 'Challenger' specimen agrees with this portion of Mr. Cassin's description, with the following exceptions, viz.:—the occiput and hinder part of the neck are white-coloured and of the same hue as the mantle; the upper surface of the shafts of the quills is brown, but without any 'reddish-chestnut' tint; the upper surface of the tail is brown, with transverse bars of a darker brown; on the middle pair of rectrices these are eleven in number, the lowest bar being subterminal; on all the rectrices the edge of the outer web and the tip are of a darker brown than the remainder of the feather, but beyond the dark tip there is at the extreme end of the feather a small central spot of white, which is more conspicuous on a new rectrix only partially grown than in the older feathers, from some of which it has been worn off by use; the inner webs of the lateral rectrices are also more or less mottled with white towards the edge. The dark transverse bars are indistinctly apparent on the under surface of the tail.

"The figure of the type specimen (U.S. Exploring Expedition, pl. iv.) agrees with the description given by Mr. Cassin, and also shows a larger bare space behind the eye than exists in the 'Challenger' specimen; but, notwithstanding this difference and those of coloration to which I have alluded, I think that the coincidence of size and form marks the two specimens as belonging to the same species, and that the example obtained by the 'Challenger' Expedition must be considered as a specimen of *Buteo solitarius* of Peale."

11. ANAS WYVILLIANA, sp. nov.

"*Anas boschas*," Dole, Pr. Boston S. N. H. xii. p. 305; Finsch et Hartl. Orn. C. P. p. xxxix. (?)

541. Male.
542. Male. } Eyes brown; legs and feet orange.

Supra nigra, plumis fusco limbatis; pileo nigro, fusco minute punctato; subtus pallide fusca, in gutture et pectore magis rufescens, in ventre magis ochracea, plumis nigro punctatis et maculatis; alis extus brunnescenti-cinereis; speculo amplo purpureo, margine supra et infra albo inde nigro ornato; axillaribus albis; rostro superiore nigro, inferiore carneo; pedibus aurantiacis. Long. tota 15·0, *alæ* 9·3, *caudæ* 3·0, *rostri a rictu* 2·0, *ejusd. lat. sub naribus* 0·7, *tarsi* 1·5.

Hab. Inss. Sandwich, maris Pacifici.

This Duck belongs to the section of true *Anas* which embraces *A. obscura* of North America, *A. superciliosa* of Australia, and other species, and in which both sexes somewhat resemble the female of *Anas boschas*. The head is dark, finely pointed with brown, and

bears no trace of a superciliary stripe; the speculum is shining purple with a black border above and below; beyond the black border below the coverts terminate in a broad margin of pure white; above the upper black border, which is formed by the ends of the small coverts, there is a narrow ashy-white margin.

The description is taken from specimen 541; the other (542) is apparently a young bird and is rather smaller in its dimensions.

12. FULICA ALAI, Peale.

Fulica alai, Peale, Zool. U.S. Expl. Exp. Birds, p. 224; Cassin, Mamm. & Orn. U.S. Expl. p. 306, Atlas, pl. xxxvi.

531. Male. "Eyes red; bill flesh-coloured with a yellowish tinge; feet and legs pale slate-colour."—*J. M.*

13. TOTANUS INCANUS (Gm.).

532. Female. Eyes hazel; bill brown; legs yellow.

3. On a Small Collection of Birds from the Samoan Islands and the Island of Rotumah, Central Pacific. By W. A. FORBES, F.Z.S.

[Received March 1, 1878.]

Mr. Sclater has lately put into my hands for determination a small collection of birds from the above localities, made by the Rev. G. Brown, C.M.Z.S., of the Wesleyan Mission. It consists of 47 skins referable to 19 species. Of these all but 4 skins, of two species, are from the Samoan Islands of Upolu and Savaii, and are well known already as inhabitants of these islands. They require no further notice here, except one.

PACHYCEPHALA ICTEROIDES, Peale; Finsch & Hartl. Faun. Centr.-Polyn. p. 76.

Three examples of this species, in different stages of plumage, though none are quite adult, traces of the rufous plumage of immaturity remaining to a greater or less extent. All are marked "from Upolu;" and the native name given is "Vasavasa." Mr. Layard (P. Z. S. 1876, p. 494) doubts the occurrence of this species in Samoa, and refers the bird from those islands to *P. flavifrons* (Peale), which, as Dr. Finsch has shown (J. f. O. 1872, p. 39), is the adult male of *P. icteroides*.

The island of Rotumah is, as far as I am aware, entirely unknown ornithologically; and the three skins in this collection from that locality are, I believe, the first that have ever been received from the island. It is a small island, 4 or 5 miles in extent from north to south, and was discovered by Captain Edwards in his search for the 'Bounty' in 1791. It lies nearly midway between the Fijis and the Ellice group, in about long. 177° E., lat. 12½° S. Some account of it will

be found in the 'South-Pacific Directory,' 3rd edition, p. 627 (London, 1871). The two species of birds of this island represented are,—

APLONIS VITIENSIS, Layard, P. Z. S. 1876, p. 502.

Aplonis tavuensis, F. & H. Faun. Centr.-Polyn. p. 103, t. x. f. 2 (nec Gmelin).

One skin of this species, agreeing with skins from Fiji in the British Museum, and others from the same islands in the 'Challenger' collections, determined by Dr. Finsch as "*Aplonis vitiensis*, Lay." (conf. Finsch, P. Z. S. 1877, p. 735). The native name is given as "Husila."

MYZOMELA CHERMESINA, G. R. Gray, G. B. i. pl. 38; id. Cat. B. Trop. Islands, p. 11.

This species was figured by Mitchell in the 'Genera of Birds,' but not described; nor was any locality mentioned for it in the list of species of *Myzomela* in the same work. Bonaparte, however, in his 'Conspectus,' gave "New Guinea" as the habitat, though what reason for this he had, other than that at that time "Nova Guinea" was a convenient "refuge for the destitute," is not known. The figure in the 'Genera' represents a bird with a uniform scarlet under surface; but fortunately the original specimen is still in existence, mounted in the Bird Gallery of the British Museum. Two specimens of a *Myzomela*, certainly distinct from any other known as inhabiting the Pacific Islands, were contained in Mr. Brown's collection from Rotumah; and a look at Gray's figure sufficed to indicate considerable differences between the two birds. On examining, however, Gray's type of his *M. chermesina*, it became evident at once that the two birds were really identical, and that the apparent difference, consisting in the belly and vent being of a uniform red in the plate, instead of a brownish-black, was due to a mistake on the artist's part. As *Myzomela chermesina* has not yet been described, and is irrecognizable from Gray's figure, I herewith proceed to give a diagnosis and description.

MYZOMELA CHERMESINA, G. R. Gray, Gen. B. i. pl. 38; id. B. Trop. Isl. Pacif. p. 11; Bp. Consp. Av. i. p. 394. sp. 3 ("ex Nova Guinea"!); Gray, Handl. B. i. p. 154. no. 1989 ("New Guinea?").

♂ (*ad.*?). *Fusco-nigricans, alis caudaque nitore nonnullo metallico; mento, gula, pectore lateribusque abdominis, cum dorso uropygioque, nitide coccineis, plumis basi nigris; rostro nigro, pedibus brunneo-corneis. Long. tot. circa* $4\frac{1}{2}$, *rostr.* $\frac{5}{8}$, *al.* 3, *caud.* 2 (poll. Angl.).

Male. Fuscous-black; interscapulars and wing-coverts darker, and with a slight metallic gloss, which extends onto the tail; primaries browner, the internal web narrowly margined with whitish, except at tip; wings beneath pale greyish-brown; chin, throat, breast, sides of belly till near legs, back, rump, and upper tail-coverts shining crimson-scarlet, the feathers black at base; beak black; legs dark horn-colour.

A second specimen, marked female, resembles in general that described, but is rather smaller, and all the colours are duller, particularly the red of the throat and chest, so that the black-brown of the back forms a broad ring between the chin and breast. The under wing-coverts are whitish, and the pale internal margin of the primaries more conspicuous. It is probably a younger bird.

Habitat. Island of Rotumah, Central Pacific. Native name "Aramea." I ought to mention that Mr. Sharpe has lately received, in a collection from Erromango, one of the New Hebrides, a specimen of this bird almost identical with mine in every respect. This is very curious; for Erromango is far removed from Rotumah, and the neighbouring island of Tanna is inhabited by a *distinct* species (*Myzomela cardinalis* (Gm.), figured in Latham's Synopsis, vol. i. pl. xxxiii. fig. 2).

4. A List of the Birds collected by Mr. E. C. Buxton at Darra-Salam, on the coast of Africa opposite Zanzibar. By Francis Nicholson, F.Z.S.

[Received March 4, 1878.]

My friend Mr. Buxton, whose ornithological collection from Sumatra was described by the Marquis of Tweeddale last year ('Ibis,' 1877, p. 283), and whose name is therefore already well known to naturalists, has recently returned from a short visit to the Zanzibar coast, and has brought with him a small collection of birds. These he has lent to me for description; and I give a list of the species in the present paper, merely adding my regret that it is not a longer one. Owing, however, to a sharp attack of fever, Mr. Buxton was only able to remain on the coast a little more than a fortnight; and this accounts for the smallness of the collection. I feel sure that ornithologists will agree that, considering the collecting of birds was not the primary object of Mr. Buxton's expedition, the number of species is not a meagre one for a fortnight's shooting.

Our knowledge of East-African ornithology is not very extensive at present; and in the present paper I have referred to the only two essays which have dealt with the birds of the Zanzibar district. These are as follows:—

1. Hartlaub, G. Report on a Collection of Birds formed in the Island of Zanzibar by Dr. John Kirk.—P. Z. S. 1867, p. 823.
2. Sharpe, R. B. On a Collection of Birds from Mombas, in Eastern Africa.—P. Z. S. 1873, p. 710.

There remains also the list of birds procured by the late Baron von der Decken, and described by Dr. Cabanis in the third volume of his 'Reisen in Ost-Afrika,' and the inestimable work of Drs. Finsch and Hartlaub, the 'Vögel Ost-Afrika's.' I have followed the order and classification adopted in the last-mentioned book.

I have only to add that the locality where this collection was made is Darra-Salam, described by Mr. Buxton as a splendid harbour, on the main coast, S.E. of Zanzibar: the country is agricultural for a mile, and then covered with bush and low timber. The birds were procured in July 1877.

Besides the birds brought by Mr. Buxton I am indebted to Dr. Günther for permission to examine a small parcel of skins sent to him by Messrs. I. and F. Moir of Zanzibar, and collected by them also at Darra-Salam. Although most of the birds had already been obtained by Mr. Buxton, there are one or two not included in that gentleman's captures.

1. ASTUR TACHIRO.

Astur tachiro (Daud.), Sharpe, Cat. B. i. p. 99.
Nisus tachiro, Finsch & Hartl. Vög. Ostaf. p. 78.
A young female in Messrs. Moir's collection.

2. ASTURINULA MONOGRAMMICA.

Asturinula monogrammica (Temm.); Finsch & Hartl. Vög. Ost-Afr. p. 59; Sharpe, P. Z. S. 1873, p. 711; id. Cat. B. i. p. 275.
Two specimens. It is quite evident from the way in which these two birds differ in the character of the bars on the under surface, that there is some variation in this respect to be accounted for, and *A. meridionalis*, Hartl. (Cf. Sharpe, Cat. i. p. 277) cannot be separated as a species.

3. GLAUCIDIUM CAPENSE.

Glaucidium capense (Smith); Sharpe, Cat. B. ii. p. 223.
Athene capensis, Finsch & Hartl. *t. c.* p. 98.
Two specimens of this rare little Owl, agreeing with Mr. Sharpe's description of the type in the British Museum. Dr. Finsch and Hartlaub considered it probable that this species would be more plentiful on the east coast of Africa than it is in South Africa; and this seems likely to prove the case.

4. EURYSTOMUS AFER.

Eurystomus afer (Lath.); Finsch & Hartl. *t. c.* p. 150; Sharpe, Ibis, 1871, p. 274; id. P. Z. S. 1873, p. 712.
Two specimens: wing 6·8 inches.

5. CORACIAS CAUDATA.

Coracias caudata (L.); Hartlaub, P. Z. S. 1867, p. 824; Finsch & Hartl. *t. c.* p. 154; Sharpe, Ibis, 1871, p. 194; id. P. Z. S. 1873, p. 712.

6. HALCYON CHELICUTENSIS.

Halcyon chelicutensis (Stanl.); Finsch & Hartl. *t. c.* p. 162; Sharpe, *t. c.* p. 712.
Halcyon striolata, Hartl. *t. c.* p. 824.
Two specimens.

7. CERYLE RUDIS.

Ceryle rudis (L.); Finsch & Hartl. *t. c.* p. 175.

Two specimens of this widely distributed species, which, however, does not seem to be so common in E. Africa as elsewhere, as this is the first record of it from Zanzibar.

8. MEROPS SUPERCILIOSUS.

Merops superciliosus, L.; Finsch & Hartl. *t. c.* p. 178.

Three specimens, all of the brown-headed type, the true *M. superciliosus*.

9. MEROPS PUSILLUS.

Merops pusillus (Müll.); Sharpe, *t. c.* p. 712.
M. minutus, V.; Finsch & Hartl. *t. c.* p. 188.

Three specimens; the eyebrow in each being very distinctly blue.

10. MEROPS ALBICOLLIS.

Merops albicollis, V.; Finsch & Hartl. *t. c.* p. 185; Sharpe, *t. c.* p. 712.

Several specimens of this very common Bee-eater.

11. DICROCERCUS HIRUNDINACEUS.

Dicrocercus hirundinaceus, Sharpe, ed. Layard, B. S. Afr. p. 101.
Merops hirundineus, Finsch & Hartl. *t. c.* p. 193.

On comparing this specimen with other African individuals, I notice that the colour of the blue on the abdomen and under tail-coverts is paler, and I can find no trace of a blue eyebrow in Mr. Buxton's specimen.

12. IRRISOR ERYTHRORHYNCHUS.

Irrisor erythrorhynchus (Lath.); Hartl. *t. c.* p. 824; Finsch & Hartl. *t. c.* p. 202; Sharpe *t. c.* p. 712.

One specimen.

13. CINNYRIS MICRORHYNCHUS.

Cinnyris microrhynchus, Shelley, Monogr. Cinnyridæ, part 1.
Nectarinia jardinii, Hartl. P. Z. S. 1867, p. 824; Finsch & Hartl. *t. c.* p. 218, pl. ii. fig. 1; Sharpe, *t. c.* p. 713 (nec Verr.).
Cinnyris jardinii, Cab. in Von der Decken's Reis. iii. p. 29.

An adult male fully bearing out the distinctions put forward by Captain Shelley.

14. CINNYRIS GUTTURALIS.

Cinnyris gutturalis (L.); Shelley, Monogr. part 1; Sharpe, ed. Layard, B. S. Afr. p. 311.
N. gutturalis, Hartl. *t. c.* p. 824; Finsch & Hart. *t. c.* p. 216; Sharpe, *t. c.* p. 713.
Cinnyris gutturalis, Cab. *t. c.* p. 28.

Several specimens.

15. ANTHODIÆTA ZAMBESIANA.

Anthodiæta zambesiana, Shelley, Monogr. Cinnyr. part 1; Sharpe, ed. Layard, B. S. Afr. p. 321.

N. collaris, Hartl. *t. c.* p. 824; Finsch & Hartl. *t. c.* p. 223; Sharpe, *t. c.* p. 713 (nec V.).

N. corallis, Cab. *t. c.* p. 28.

An adult male individual, confirming the characters given by Captain Shelley.

16. DRYMŒCA AFFINIS.

Drymœca affinis, Smith; Sharpe, ed. Layard, B. S. Afr. p. 259.

One example. Cf. Sharpe, *l. c.*

17. CISTICOLA ISODACTYLA.

Cisticola isodoctyla, Peters; Sharpe, ed. Layard's B. S. Afr. p. 269.

Drymœca isodactyla, Finsch & Hartl. *t. c.* p. 236.

Three specimens.

18. MACRONYX STRIOLATUS.

Macronyx striolatus, Heugl. J. f. O. 1863, p. 164.

M. croceus, Finsch & Hartl. *t. c.* p. 276 (nec V.).

Two specimens. I think that Heuglin was wrong in reuniting his *M. striolatus* with *M. croceus*. It seems to me to be a distinct bird, with the sides of the neck streaked with white near the black collar, whilst *M. croceus* has no white streaks on the side of the neck.

19. ANTHUS RAALTENI.

Anthus raalteni, Temm.; Hartl. *t. c.* p. 825; Cab. *t. c.* p. 22; Finsch & Hartl. *t. c.* p. 274.

Three specimens agreeing with Zanzibar skins of Dr. Kirk's in the British Museum, and identified as above by Drs. Finsch & Hartlaub.

20. CRATEROPUS KIRKI.

Crateropus kirkii, Sharpe, Layard's B. S. Afr. ed. 2, p. 213.

One specimen of a Babbling Thrush in bad order. It appears to belong to Mr. Sharpe's new species.

21. PYCNONOTUS NIGRICANS.

Pycnonotus nigricans (V.); Finsch & Hartl. *t. c.* p. 297; Sharpe P. Z. S. 1873, p. 712.

Ixus nigricans, Hartl. *t. c.* p. 825.

Three specimens.

22. ORIOLUS LARVATUS.

Oriolus larvatus, Licht.; Sharpe, P. Z. S. 1873, p. 714; id. Cat. B. iii. p. 217.

An adult in Messrs. Moir's collection.

23. Buchanga assimilis.

Buchanga assimilis (Bechst.); Sharpe, Cat. B. iii. p. 247.
Dicrurus divaricatus (Licht.); Finsch & Hartl. *t. c.* p. 323; Sharpe, *t. c.* p. 714.
Two specimens.

24. Telephonus erythropterus.

Telephonus erythropterus (Shaw); Finsch & Hartl. *t. c.* p. 336; Sharpe, *t. c.* p. 714.
Two specimens.

25. Dryoscopus affinis.

Dryoscopus affinis, Gray; Hartl. *t. c.* p. 824.
Laniarius affinis, Finsch & Hartl. *t. c.* p. 349.
L. salimæ, iid. *t. c.* p. 349.
Dryoscopus cubla et *D. salimæ*, Sharpe, *t. c.* p. 714.
I forwarded these birds to my friend Mr. R. Bowdler Sharpe, who is working at the genus, and am indebted to him for the synonymy as above, and for the following note:—"I am glad to see that Dr. Hartlaub, in his new work on the Birds of Madagascar, unites *D. salimæ* to *D. affinis*. The two specimens now sent by Mr. Buxton represent these two supposed species—the male being *D. affinis*, and the female with white lores and grey rump *D. salimæ*. A large series of dated and sexed specimens must be examined before we can understand for certain the plumages of these little Bush-Shrikes. In the present pair the female has a totally black wing, and has grey bases to the scapulars, while the male has a narrow white edging to some of the wing-coverts, and very distinct white bases to the scapulars."

26. Bradyornis pallidus.

Bradyornis pallidus (Müller); Sharpe, Cat. B. iii. p. 310.
B. subalaris, Sharpe, *t. c.* p. 713, pl. lviii. fig. 1.
Two specimens.

27. Sigmodus graculinus.

Sigmodus graculinus (Cab.); Sharpe, Cat. B. iii. p. 325.
Prionops graculinus, Cab. *t. c.* p. 24, taf. iii.
A specimen in changing plumage, but without any white bar on the lower surface of the wing.

28. Pholidauges verreauxi.

Pholidauges verreauxi, Bocage in Finsch & Hartl. Vög. Ostafr. p. 867; Sharpe, *t. c.* p. 714.
P. leucogaster, Finsch & Hartl. *t. c.* p. 376.
An adult male, with the characteristic white edging to the outer tail-feather. It was included in the 'Vögel Ost-Afrika's' as *P. leucogaster*, from its being met with in Mozambique by Commander Sperling. There can be little doubt, however, that *P. verreauxi* of South Africa

goes up the east coast, and extends at least as far as Angola on the west coast.

29. Estrelda cyanogastra.

Estrelda cyanogastra (Daud.); Sharpe, Cat. Afr. B. p. 65. no. 616.

A single specimen in Messrs. Moir's collection.

30. Hyphantornis nigriceps.

Hyphantornis nigriceps, Layard; Finsch & Hartl. *t. c.* p. 392; Sharpe, *t. c.* p. 715.

One specimen of this Weaver-bird was included in the collection sent by Messrs. Moir.

31. Pytelia melba.

Pytelia melba (L.); Finsch & Hartl. *t. c.* p. 441.

A female specimen, and of course difficult to determine correctly from this sex only; but it appears to agree with examples from South Africa in the British Museum. Drs. Finsch and Hartlaub, moreover, record it from South Mozambique, where Dr. Peters obtained it.

32. Euplectes nigriventris.

Euplectes nigriventris (Cass.); Sharpe, *t. c.* p. 715.
Pyromelana nigriventris, Finsch & Hartl. *t. c.* p. 415.

An adult male specimen.

33. Euplectes capensis.

Euplectes capensis (L.).
Pyromelana capensis, Finsch & Hartlaub, *t. c.* p. 416.

An adult male specimen.

34. Passer diffusus.

Passer diffusus, Smith; Hartl. *t. c.* p. 826.
P. swainsoni, Finsch & Hartl. *t. c.* p. 451.

Two specimens.

35. Colius leucotis.

Colius leucotis, (Rüpp.); Finsch & Hartl. *t. c.* p. 472; Sharpe, *t. c.* p. 714.

One specimen.

36. Tockus melanoleucus.

Tockus melanoleucus (Licht.); Sharpe, ed. Layard, B. S. Afr. p. 127.
Buceros melanoleucus, Finsch & Hartl. *t. c.* p. 485.

Two specimens.

37. Pœocephalus fuscicapillus.

Pœocephalus fuscicapillus (Verr.).

Psittacus fuscicapillus, Hartl. *t. c.* p. 826.
Pionias fuscicapillus, Finsch & Hartl. *t. c.* p. 499.
Pœocephalus fuscicapillus, Sharpe, *t. c.* p. 711.
Three specimens.

38. POGONORHYNCHUS MELANOPTERUS.

Pogonorhynchus melanopterus (Peters); Finsch & Hartl. *t. c.* p. 504; Marsh. Monogr. Capit. pl. vii.
An adult specimen of this rare Barbet.

39. BARBATULA PUSILLA.

Barbatula pusilla (Dum.); Marshall, *t. c.* p. 117, pl. xlviii.
I have carefully compared Mr. Buxton's specimen with two others in the British Museum from Abyssinia (*Blanford*); and I find them quite identical in coloration, the Zanzibar bird being the least bit smaller (wing 2·05 in.). This species is new to the avifauna of Eastern Africa.

40. COCCYSTES JACOBINUS.

Coccystes jacobinus (Bodd.); Sharpe, P. Z. S. 1871, p. 597, et 1873, p. 711.
One specimen in moult.

41. CENTROPUS SUPERCILIOSUS.

Centropus superciliosus (Rüpp.); Hartl. *t. c.* p. 826.
Several specimens.

42. TRERON DELALANDII.

Treron delalandii (Bp.); Hartl. *t. c.* p. 827: Finsch & Hartlaub, *t. c.* p. 535.
One specimen agreeing with a South-African example of the above-named species, excepting that the size is rather smaller (wing 7·2 inches), and the bill rather long. The markings and colour of the tail appear to be identical.

43. FRANCOLINUS GRANTI.

Francolinus grantii, Hartl. P. Z. S. 1865, p. 665, pl. 39. fig. 1; Finsch & Hartl. *t. c.* p. 589.
Identical with typical specimens of *Francolinus rovuma*, Gray (Cat. Gallinæ Brit. Mus. 1867, p. 52), which is identified with *F. granti* by Drs. Finsch and Hartlaub.

44. ACTITIS HYPOLEUCUS.

Actitis hypoleucus (L.); Hartl. *t. c.* p. 827; Finsch & Hartl. *t. c.* p. 752.
One specimen.

5. Descriptions of new Species of Central-American Butterflies of the Family Erycinidæ. By F. DuCane Godman and Osbert Salvin.

[Received March 7, 1878.]

The species of Erycinidæ described in the present paper are some that we have been unable to find names for when examining the Central-American representatives of the family. Specimens of the greater part of them are in our collection; but some have been described from examples in that of Mr. H. Druce, whilst others have been lent to us by Dr. O. Staudinger of Dresden, and by Mr. T. Belt. We hope, before long, to publish figures of the whole of them.

1. Eurygona hypophæa.

♂. Exp. 1·15 in. Outer margin of secondaries slightly angulated; above nearly uniform dark brown with a slight rufous tint in the centre of each wing; beneath brown; across the primaries beyond the cell a broad, indistinct, dark band; across the middle of the secondaries a similar band; a submarginal row of nearly obsolete black spots on the secondaries.

♀. Exp. 1·2 in. Outer margin of secondaries more strongly angulated in the middle than in the male; above dull brown, slightly paler on the distal half of the secondaries; three white spots on the primaries, one at the end of the cell and two beyond it, one on either side of the second median branch: beneath, much paler, nearly uniform; an indistinct, narrow, dark band passes from the costa of the primaries inside the two outermost of the white spots and across the secondaries, curving round to near the middle of the inner margin; a submarginal row of black spots with minute white ones associated with them on the secondaries.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. nostr. (♂) et Dr. O. Staudinger (♀).

2. Eurygona leucorrhoa.

♂. Exp. 1·25 in. Secondaries slightly produced, margin entire; above deep red-brown; costa, apex, and outer margin pure dark brown: beneath pale earthy brown, distal third of the primaries and the apex of the secondaries darker; distal half of the secondaries silvery grey; a narrow brown line crosses the middle of the median branches of the primaries, and crossing to the secondaries curves within the space between the first median branch and the submedian nervure and passes to the inner margin; the secondaries have a submarginal row of black spots surrounded by silvery white, that between the lower radial and second median branch being the largest; the margin itself at its most prominent part is rufous.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. nostr. et Dr. O. Staudinger.

3. Eurygona amphidecta.

♂. Exp. 1·3 in. Secondaries slightly produced, outer margin distinctly dentate; above brownish red; costa and outer margin of both wings (the secondaries only as far as the middle of the outer margin) deep brown: beneath nearly uniform brown; a common narrow band runs beyond the cell across the primaries, and curving gradually on the secondaries passes to the inner margin; a black spot with white outer edge near the margin of the secondaries between the lower radial and second median branch; between it and the anal angle are five similar smaller spots; margin at the anal angle rufous; inside the spots is an indistinct band parallel to the margin.

♂. Exp. 1·5 in. Earthy brown, each wing paler in the middle, with a central spot as dark as the margin; beneath paler, nearly uniform, the dark bands more distinct than in the male, and the secondaries with a row of submarginal nearly obsolete dark spots, and a similar row of less defined spots round the outer margin of the primaries.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. Dr. O. Staudinger.

4. Eurygona inconspicua.

♀. Exp. 1·1 in. Secondaries rounded; upper surface uniform pale earthy brown, rather darker about the apex of the primaries; through this colour the bands of the underside are faintly seen: beneath whitish tinged with fawn-colour; a rufous band crosses both wings through the end of the cell in each, and turning sharply between the first median branch and submedian nervure of the secondaries passes to the inner margin; a second band crosses the primaries between the end of the cell and the apex; the outer margin of the same wings is dark but less rufous than the bands; on the secondaries is a submarginal row of black spots, those on either side of the median nervure being the largest (the lower one larger than the other) and nearly round; those near the anal angle are linear and surrounded by white; the margin of the secondaries is narrowly rufous, and a dark band runs between the large black spots and parallel to the inner band from the costa to where the inner band turns to the inner margin.

Hab. Costa Rica, Cache (*H. Rogers*); Veragua, Chiriqui (*Ribbe*).

Mus. nostr. et Dr. O. Staudinger.

5. Eurygona russata.

♀. Exp. 1·5 in. Above brown, a large fulvous spot on the median branches of the primaries; secondaries, except the margin next the apex, red-brown, darker than the spot on the primaries: beneath greyish white; marginal fourth of the primaries darker; a narrow dark band crosses the primaries beyond the cell, and following irregularly the curve of the margin of secondaries passes to the inner margin; a submarginal row of black subtriangular spots edged with

white on the secondaries, that between second median branch and lower radial the largest.

Hab. Veragua, Chiriqui (*Arcé*).

Mus. H. Druce.

6. LIMNAS MELANOCHLORA.

♂. Exp. 1·3 in. Above black, with a broad central stripe of rich orange passing longitudinally through both primaries and secondaries from base to outer margin: beneath, as above, but somewhat more subdued in colour.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. nostr. et Dr. Staudinger.

Obs. Allied to *L. bryaxis*, but the wing-stripes narrower and their edges parallel; their colour, too, is orange instead of yellow.

7. LIMNAS CÆRULEATA.

♂. Exp. 1·55 in. Above dark, with a rich blue gloss; across the primaries to the costa, a little beyond the middle, a distinct orange-yellow band with parallel edges: beneath dark blue-black, with the band of the primaries as above; between the submedian and median nervures, and between the median branches of the secondaries are blue-grey streaks, which become more distinct near the anal angle.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. nostr.

It will probably be necessary to remove this species, *L. bryaxis*, and *L. melanochlora* from *Limnas* and place them in a distinct genus.

8. CYRENIA PYRIPPE.

♂. Exp. 1·8 in. Allied to *C. martia*. Secondaries shorter, and outer margin less produced and rounded; the white and red spots of the secondaries above nearly obsolete; beneath the white spot of the same wings is oval instead of round, and placed nearer the outer margin.

Hab. Veragua (*Arcé*).

Mus. nostr.

9. ITHOMEIS IMITATRIX.

Ithomeis eulema, Butl. & Druce, P. Z. S. 1874, p. 353 (nec Hew.).

♂. Exp. 2·15 in. Primaries and margin of the secondaries black; a curved row of six ochraceous spots nearly parallel to the outer margin of the primaries, the three nearest the costa elongated; three similar spots, one near the end of the cell and one on each side of the second median branch; an obsolete streak between the median and submedian nervures, and the secondaries (except the margin) tawny red; four small yellow spots within the black margin of the secondaries: beneath as above, the spots in the margin of the secondaries being larger and seven in number; this black margin passes on to the base of the wing, leaving the basal half of the costa tawny red.

Hab. Veragua and Costa Rica.

Mus. H. Druce.

Obs. Allied to *I. eulema*, from which it differs in the primary wings being black almost to the base, and in the deeper tint of the tawny red of the secondaries.

10. SYMMACHIA RHACOTIS.

♂. Exp. 1·2 in. Allied to *S. domitianus*, from which it differs above in having a green patch near the anal angle of the secondaries instead of a submarginal line of the same colour; beneath the colour is paler and more ochraceous, and the metallic spots more numerous and more regularly dispersed over the whole under surface of the wings.

Hab. Guatemala, Polochic valley (*Hague*); Honduras, S. Pedro (*G. M. Whitely*).

Mus. nostr.

11. MESENE IGNICAUDA.

♂. Exp. 1·0 in. Above black, a spot on the inner margin of either secondary and the abdomen red; beneath dark brownish, profusely spotted with black grey-edged spots.

♀ like the ♂; but the red spot extends across the secondaries and nearly to the end of the cell of the primaries; beneath the red spot of the primaries appears as above; abdomen dark.

Hab. Veragua (*Arcé*).

Mus. nostr.

Obs. Allied to *M. ærope*, but the red of the secondaries more restricted, and the abdomen red instead of black.

12. MESENE SILARIS.

♂. Exp. 1·05 in. Margins of both wings (except the inner broadly) brownish, enclosing a pale lemon-yellow patch common to both wings; beneath exactly as above.

Hab. Nicaragua, Chontales (*Belt*).

Mus. T. Belt et nostr.

Perhaps allied to *M. pyrippe*, but differing both from it and all its immediate congeners by the paleness of the inner portion of the wings (in *M. pyrippe* these are red) and by the breadth of the dark border.

13. MESENE TYRIOTES.

♂. Exp. 1·1 in. Above brownish black, a broad band of orange red crossing the middle of both secondaries and the body; beneath uniform brownish black, rather paler than above.

♀ dark brown, a band of orange-red (paler than in the male) crossing the primaries from the middle of the costa to the anal angle; beneath as above, but rather paler in colour.

Hab. Veragua, Chiriqui (*Ribbe*), Calobre (*Arcé*).

Mus. nostr.

Obs. A close ally of *M. sagaris*, in which the orange band in the

male passes onto the primary wings. In the present species this band is restricted to the secondaries.

14. PACHYTHONE GIGAS.

♀. Exp. 1·65 in. Black, with a large ovate spot in the apical third of the primaries, another, pointed, at the base of the wing, and extending along the inner margin, but not reaching to the costa, and the secondaries, except the margin, pale yellow; beneath as above, the margin of the secondaries not extending over the whole of the costa.

Hab. Panama (*Ribbe*).

Mus. Dr. O. Staudinger.

Obs. In coloration this species resembles the female of *Aricoris gelasine*, described by Westwood as *A. myrtis*. The very minute palpi and the short antennæ indicate its proper position in the genus *Pachythone*. It is, however, much larger than any member of the genus hitherto described.

15. CHARIS VELUTINA.

♂. Exp. 1·15 in. Dark brown above, with darker obsolete bands on the central portion of both wings, arranged more or less concentrically, two subparallel submarginal metallic bands on both wings, the inner one on the primaries irregular and interrupted: beneath rich dark purple with obsolete black spots corresponding in position with the indistinct bands of the upper surface; a single narrow submarginal metallic band much interrupted on the anterior wings; cilia of both wings dark with small white equidistant spots.

Hab. Guatemala, Polochic valley (*H. Hague*).

Mus. nostr.

Obs. Allied to *C. iris*, Staudinger; but the under surface differs in being purple instead of rich indigo-blue. In *C. iris* the fringe of both wings is pure white; in the present species it is dark with but few white spots.

16. CHARIS CROCEA.

♂. Exp. 1·15 in. Above rich orange-red, with dark spots along the costa, outer margin of the primaries, and outer and inner margins of secondaries; those on the outer margin of the primaries almost confluent, and with the marginal row of the secondaries containing the metallic spots characteristic of the genus; the inner area of the wings devoid of spots: beneath, as above, but the spots of the costa more confluent and those of the outer margin of the secondaries less so; the spots, too, are generally dispersed over the wings.

Hab. Veragua, Calobre (*Arcé*).

Mus. nostr.

Obs. Allied to *C. perone*, which it resembles as to colour; but the spots above are fewer in number and not so generally distributed.

17. CHARIS HOLOSTICTA.

♀. Exp. 1·08 in. Above lemon-yellow sprinkled with small dark

spots nearly evenly distributed over the whole area of the wings; a submarginal metallic line round the outer margin of both wings: beneath as above, the yellow colour being a little paler and the spots slightly larger.

Hab. Veragua (*Arcé*).

Mus. nostr. et H. Druce.

Obs. Also allied to *C. perone*, but the ground-colour lemon instead of orange-yellow, and the spots on the wings rather fewer in number.

18. CHARIS PŒCILOPTERA.

♀. Exp. ·95 in. Above pale greyish brown, profusely spotted with yellowish-white spots, those on the primaries gradually becoming larger towards the outer margin, the margin itself being broadly unspotted, except a submarginal row of minute spots, joining which on their outer sides are small black spots; the submarginal metallic spots, though present, are scarcely visible: beneath, the primaries as above, but the secondaries are silvery-white with a few irregular dark spots chiefly in the region of the costa.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. Dr. O. Staudinger.

19. CHARIS OCHRIAS.

♂. Exp. 1·2 in. Above white with a slight yellowish tint; primaries with four black spots along the costa, one at the apical angle, two on the outer margin, one at the anal angle, two on the inner margin, and one within the area of the wing beyond the cell; secondaries with six black spots round the edge and three within the area of the wing; submarginal metallic line (as usual in the genus) but feebly developed: beneath precisely as above.

Hab. Costa Rica, Irazu (*H. Rogers*).

Mus. nostr.

Obs. Allied to *C. sulphurea*, R. Felder (with the type of which it has been compared), from Mexico, from which it differs in being paler in colour and in having all the spots on the outer margin larger; there is also a spot on the inner margin of the primaries, wanting in *C. sulphurea*.

20. THAROPS PURPURATA.

♂. Exp. 1·5 in. Above rich purplish blue, apical portion of primaries and apex of secondaries brownish black; some dark elongated transverse spots on the distal two thirds of the primaries: beneath greyish white, apex of primaries and outer margin of both wings brownish; small brownish spots over the whole under surface, those nearest the apical and anal angles of the secondaries slightly the largest.

♀ like the male, but the wings more obtuse, and the secondaries above, like the primaries, crossed with dark marks.

Hab. Guatemala, Polochic valley (*Hague*); Veragua (*Arcé*).

Mus. nostr.

Obs. Allied to *T. menander*, but more purple in tint above; beneath purer white, and the spots at the apical and anal angles of the secondaries smaller. In colour it resembles *T. coruscans* and *T. nitida*, but differs from both in the arrangement of the spots of the under surface.

21. THAROPS ISTHMICA.

♂. Exp. 1·5 in. Allied to *T. splendida*, but smaller, and the anal angle of the secondaries less produced: beneath the ground-colour is nearly uniformly sprinkled with pinkish scales, the central area of both wings in *T. splendida* being decidedly whiter; there are no conspicuous spots at the apical and anal angles of the secondaries, and the spot on the costa is much smaller.

Hab. Veragua, Calobre (*Arcé*).

Mus. nostr.

22. LEMONIAS PELARGE.

♂. Exp. 1·33 in. Primaries, base, and narrow outer margin of secondaries dark brown; some indistinct blue spots near the apex of the primaries; a spot near the anal angle of the primaries and the inner area of the secondaries reddish orange: beneath grey sprinkled with dark scales; proximal half of both wings with distinct black spots; outer marginal area of both wings darker, variegated with lighter marks, especially at the apical angle of both wings and the anal angle of the primaries.

Hab. Guatemala, Polochic valley (*H. Hague*).

Mus. nostr.

Obs. Allied to *L. parthaon*, in which the blue spots of the primaries are very distinct; in the present species the orange of the secondaries extends almost to the costa: beneath the primaries have much more blue-grey, and the submarginal spots of the secondaries are obsolete, being large in *L. parthaon*.

23. LEMONIAS THEAGES.

♂. Exp. 1·05 in. Above dark brown, central area of secondaries to the inner margin, and numerous spots over the margin of the secondaries and the whole area of the primaries (two, one at the end of the cell and one below it, the largest), white; beneath as above, except that the base of the secondaries is white, and bears several black spots.

Hab. Veragua (*Arcé*); Costa Rica (*Rogers*).

Mus. nostr.

Obs. Allied to *L. orpheus*; but the white spots of the primaries are much larger, and the dark margin to the secondaries broader.

24. LEMONIAS DEBILIS.

♂. Exp. 1·2 in. Dark brown above irrorated with ochraceous scales, dark brown spots with ochre margins irregularly dispersed over both wings, except along the outer margin of both, where they lie contiguous to one another, forming a submarginal row: beneath as

above; but, the ochraceous scales being more numerous than the brown ones, the under surface has a paler tint.

♀ like the male, but with the wings less pointed.

Hab. Veragua, Chiriqui (*Ribbe*); Nicaragua, Chontales (*Belt*).

Mus. nostr. et T. Belt.

25. LEMONIAS HYPOGLAUCA.

♀. Exp. 1·15 in. Outer margin of primaries curved outwardly; the apex slightly falcate: above greyish brown with blackish spots dispersed over the surface of both wings, those within and below the cell of the primaries the largest; the spots on the secondaries are arranged in two submarginal rows which follow the curvature of the outer margin; and an irregular cluster in and about the end of the cell: beneath whitish, with spots corresponding to those of the upper surface, those on the primaries dark, those on the secondaries rufous.

Hab. Mexico.

Mus. H. Druce.

Besides this specimen in Mr. Druce's collection, we have seen others in the Berlin Museum.

26. NYMPHIDIUM HÆMATOSTICTUM.

♂. Exp. 1·6 in. Costa and outer margin of primaries dark brown, a triangular patch with its base on the inner margin and apex towards the apical angle, an isolated spot near the apex, and the whole central portion of the secondaries white; a submarginal row of black spots on both wings, bounded on either side by narrow blue-grey waved lines; margin of the secondaries inwardly red for two thirds of its length from the anal angle, the rest and a narrow margin dark brown: beneath with the margins as above, but with the inner irregular line encircling the black submarginal row of spots nearly white; two irregular white spots on the outer margin of the primaries, one near the middle and one near the apical angle; the red of the secondaries more restricted.

Hab. Panama (*Ribbe*).

Mus. Dr. O. Staudinger.

27. NYMPHIDIUM ICTERICUM.

♂. Exp. 1·6 in. Base of secondaries and primaries ochre-brown; a broad band, constricted in the middle, passes from the middle of the costa towards the middle of the outer margin, a large irregular spot from the anal angle halfway along the inner margin, an irregularly defined double submarginal row of spots, and the whole of the remainder of the secondaries ochre-yellow; across the cell and the region of the median nervure are some obsolete dark transverse bars: beneath as above, but slightly paler.

♀ like the male, but less ochraceous in tint, the lighter markings being purer yellow.

Hab. Veragua (*Arcé*); Chiriqui (*Ribbe*).

Mus. H. Druce (♂), Dr. O. Staudinger (♀).

28. Nymphidium sicyon.

♂. Exp. 1·6 in. Costa of primaries, base, and outer margin of both wings dark brownish-black; inner margin and central area of both wings yellowish ochre; in the dark margin of the secondaries are two parallel yellowish submarginal lines, between which are a series of black spots: beneath paler than above; the submarginal lines in the border of the secondaries are absent; but the black spots are present.

Hab. Guatemala, Polochic valley (*H. Hague*).

Mus. nostr.

Obs. Allied to *N. agle*, but the outer margin darker, and the margin of the primaries and secondaries are without the rufous band contained in that of *N. agle*.

29. Nymphidium adelphinum.

♂. Exp. 1·85 in.; ♀, exp. 2·15 in. Closely allied to *N. lycorias*, of which it is a more southern race; it differs in having the white band in the dark margin of the secondaries almost obsolete in the male instead of a biconvex conspicuous spot; the white spot near the middle of the outer margin of the primaries is much smaller: beneath, these spots, though more distinct, are not nearly so large as in the allied species.

Hab. Costa Rica, Irazu (*Rogers*); Veragua, Calobre (*Arcé*).

Mus. nostr.

30. Nymphidium velabrum.

♂. Exp. 1·8 in.; ♀, exp. 1·95. Allied to *N. phliasus*; but the white band common to the two wings is broader, and on the primaries extends just into the cell instead of merging in the fulvous band of the same wings; this fulvous mark, in the present species, is restricted to an isolated spot in the apical area of the primaries. In the relative position of the white band and the fulvous spot this species resembles *Adelpha iphicla* and its allies, whereas *N. phliasus* resembles *A. cocala*.

Hab. Veragua, Calobre (*Arcé*).

Mus. nostr.

31. Theope isia.

♂. Exp. 1·25 in. Costa, apex (narrowly), outer margin of primaries, and cilia of secondaries dark brownish-black; secondaries and a subtriangular patch occupying from the inner margin to the end of the cell of primaries blue: beneath uniform orange.

Hab. Guatemala, Polochic valley (*H. Hague*).

Mus. nostr.

Obs. The distribution of the blue of the upper surface resembles that of *T. hypoxanthe*; the colour of the under surface is paler and purer yellow, being almost exactly the tint of the under surface of *T. eudocia*.

32. Theope barea.

♂. Exp. 1·15 in. Cell of the primaries nearly to the end, the inner margin (broadly), and the whole of the secondaries dark shining blue with a slight purple tinge; rest of the primaries dark brown with a slightly lighter central patch: beneath uniform rather dark lemon-yellow.

♀. Exp. 1·1 in. Primaries dark brown, a patch of blue covering from the inner margin to half the cell, and passing beyond it, but leaving the outer margin and costa broadly dark; secondaries the same blue colour, apex and outer margin (narrowly) dark brown; beneath the same as the male, the yellow colour being hardly so bright.

Hab. Veragua (*Arcé*); Chiriqui (*Ribbe*).

Mus. nostr. (♂), et Dr. O. Staudinger (♀).

Obs. In the colour of the upper surface this species is like *T. aureonitens*, but the blue is darker, as well as the apex of the primaries; the colour beneath is much paler yellow.

33. Theope cænina.

♂. Exp. ·95 in. Inner margin of primaries and cell nearly to the end and whole of secondaries dark shining blue slightly tinged with purple; rest of the primaries dark brown; beneath uniform pale dirty ochraceous yellow.

Hab. Veragua, Chiriqui (*Ribbe*).

Mus. nostr.

Obs. Allied to *T. barea*, described above; but the colour of the under surface is more ochraceous in tint, paler and not nearly so pure in tone.

34. Theope decorata.

♂. Exp. 1·0 in. Primaries above and margin of the secondaries black; a spot on the inner margin of the primaries near the anal angle, a few scattered scales near the base of the same, and the whole central area of the secondaries blue: beneath dark brown, the apex of the primaries lighter, nearly the basal half of the costa of the primaries and the base of the secondaries yellow; a curved band of iridescent blue, seen only in a certain incidence of light, occupies the remainder of the costa of the primaries nearly to the apex, it then crosses the wing to about the middle of the outer margin.

Hab. Nicaragua, Chontales (*Belt*).

Mus. nostr. et T. Belt.

Obs. Belongs to the *T. janus* group, from which it differs in many respects.

6. On a new Species of Indian *Prinia*.

By ANDREW ANDERSON, F.Z.S.

[Received March 18, 1878.]

(Plate XIX.)

It had been my intention to write a connected account of the birds of Northern Kumaon, the result of a two months' ornithological excursion into the Alpine regions of this part of the North-western Himalayas during the summer of 1875[1]. Time, however, has failed me, to say nothing of bad health and heavy official duties; so that I must leave all details for another time, and content myself for the present with offering to the Society a description of a *Prinia*, which I feel confident is new to science, and which was obtained in the Bagesur valley on the 18th June, 1875, at an elevation of between 3000 and 4000 feet.

PRINIA POLIOCEPHALA, sp. n. (Plate XIX.)

Similis P. stewarti, *et fronte cinerea pileo concolori, sicut in hac specie; sed dorso brunneo nec cinereo diversa; rostro nigro; pedibus pallide brunneis; iride pallide flavida; palpebris pallide stramineis.*

Long. tot. 3·8, culminis 0·45, alæ 1·7, caudæ 1·8, tarsi 0·8.

Hab. Kumaon, India.

This species is of the same group as *P. cinereocapilla* and *P. stewarti*, but is distinguished from both by trenchant characters, which may be expressed in the following synoptic table: —

a. Back grey, as also the entire head..... *stewarti*.
b. Back rufescent brown, contrasting with the head, which is grey.
a'. Forehead grey, like the crown ..... *poliocephala*.
b'. Forehead fulvous, crown of head grey.. ... . *cinereocapilla*.

This discovery of an apparently new species of *Prinia* in a comparatively speaking well-explored country like Kumaon is an event of some interest.

I should not, however, omit to mention that I am indebted to my friend Mr. W. E. Brooks for having brought to my notice that the bird in question is apparently undescribed, and that it is not "*P. cinereocapilla*," by which name I had it catalogued in my note-book.

Unfortunately, I only obtained one specimen of the new bird, a male; but at the same place a fair series of *P. hodgsoni*, all males, was also added to my collection. Both species of Warblers were in beautiful plumage; an examination into their sexual organs indicated that the latter end of June and July must be their breeding-season; and hence probably the reason why no female examples were met with.

[1] In an article contributed by me to 'Stray Feathers' for 1875, vol. iii., entitled "Little or unknown Himalayan Oology," I have already given an account of the nidification and habits of some of the birds I met with on this occasion.



Hanhart imp.

PRINIA POLIOCEPHALA



J.Smit lith.

Hanhart imp.

As might be expected, the subject of the present paper has all the habits of its near ally *P. stewarti*, for which, indeed, I mistook it on the wing. When shot it was wending its way very adroitly through dense nettle-jungle (*Girandinia heterophylla*), climbing up and down the stalks in search of mosquitoes and other insect food. The allied species to *P. policephala*, viz. *P. stewarti* and *P. cinereocapilla*, do not apparently occur in Kumaon.

In concluding my remarks on the subject, I am glad to be able to add that the Marquis of Tweeddale concurs with me in considering the *Prinia* new to science. The Marquis writing to me respecting this species, gives his opinion in the following terms, which by his permission, I here transcribe:—"Your *Prinia* seems to be a good and distinct species."

7. Notes on three stuffed Specimens of the Sea-lion of the Pribilov Islands (*Otaria ursina*). By J. W. Clark, M.A., F.Z.S.

[Received March 19, 1878.]

(Plate XX.)

The specimens I have the pleasure of exhibiting this evening were sent to the Museum of the University of Cambridge in October 1877, by the Alaska Commercial Company. Some time before that date the Company had most obligingly acceded to my request that they would endeavour to obtain for me some specimens of this Sea-lion, which is the most abundant of the two species found upon the islands ceded to them for trading-purposes by the Government of the United States, the other being Steller's Sea-lion (*Otaria stelleri*).

The "set of Seals," as the Secretary's letter terms them, consists of a male, a female, and a pup, from St. Paul's Island, Alaska. Those who have read Elliott's 'Report'[1] will remember that this is the island which is most thickly peopled by this species of *Otaria* and yields the greatest number of skins in each year. The skull and the bones of the arm and leg accompanied each skeleton; so that the age of the animal can be approximately ascertained. From the condition of those portions of the skeleton, and from the size of the animals as compared with the measurements given in the work above quoted and in Allen's 'Monograph'[2] (pp. 73–108), it is clear that they are not full-grown. This is to be regretted, as the opportunity so seldom occurs of obtaining an *Otaria* in that condition: and from the vast numbers that exist on the Prybilov Islands, I had hoped that the specimens, when they arrived, would prove to be adult. Notwithstanding this drawback, however, they are a most interesting group, and illustrate extremely well the difference in

[1] Report on the Prybilov Group or Seal Islands of Alaska. By Henry W. Elliott, 4to. Washington, 1873.

[2] "On the Eared Seals (Otariadæ). By J. A. Allen," Bull. Mus. Comp. Zool. Harvard College, Cambridge, vol. ii. p. 1.

size and build between the male and female. It is the first time, moreover, so far as I am aware, that a pair of any species of *Otaria* has been obtained from the same locality at the same season of the year, and also the first time that this particular species has been seen in this country; and I feel most grateful to the Company for their generous present.

The male is 5 feet 10 inches long, measured in a straight line from the tip of the nose to the root of the tail. The general colour of the pelage is a black inclining to grey; and the hairs are 1 inch long. A closer examination shows that the grey tint is due to the presence of white hairs intermingled with the black ones. On the neck, right across the whole superior surface, from the back of the head to the shoulders, the hair is much coarser, and individual hairs are exactly twice as long as on the back. There are a great many more white hairs on this part. The hair is equally long under the throat, but not along the sides of the neck. The shaggy appearance presented by this part of the pelage in an animal no older than our specimen gives an indication of what it must be in full-grown or aged individuals, and fully accounts for the "mane" so often described by the early voyagers. The muzzle is of a light brown, with very short hair. There is a patch of light-brown hair near the ear. The arm is destitute of hair near the distal end of the radius and ulna. There is a patch of a slightly rufous tinge behind it. A thick rufous under-fur covers the back, neck, and sides of the body, but it nowhere extends further than halfway down. The hair under the belly is thinner and shorter; indeed it is extremely short on that part, and generally rather lighter in colour than on the rest of the body, especially between the hind legs. The enormous length of the cartilaginous flaps that project beyond the toes on the hind feet is characteristic of this species, and has been already noted and figured by Allen. Examination of the skull shows that the occipital crest has not yet been developed, and that the teeth are unworn. The canines have not reached their full size. The epiphyses of the bones of the arm and leg are still quite distinct.

The female measures 3 feet along the same line as in the male. The pelage is generally much closer and finer, and the under-fur thicker, and longer in proportion to the hair. No white hairs are admixed with the dark ones; but these latter have light-yellow tips, which become larger on the breast, so that that part is quite yellow. The colour under the belly is rufous, edged with a band of a lighter shade, which has a wavy outline, ascending higher just behind the arm and in front of the hind leg. The rufous tint is darkest between the fore legs. The skull shows that the animal is quite young, much younger probably than the male—an unfortunate circumstance, as we are unable to appreciate the difference in size between the sexes with the accuracy that could be wished. It will be seen that this female is just half the length of the male. Allen (*t. c.* p. 76) gives the length of an adult male as from seven to eight feet, of an adult female as four feet.

The cub (the sex of which was not noted) is of a glossy black all over the back part of the body, inclining to brown on the nose, throat, and chest. The parts under the belly, especially between the hind legs, are of a light brown; and there is a yellow patch behind the fore limb.

The differences in colour, of which it is almost impossible to give an intelligible description on paper only, are extremely well illustrated in the accompanying figures (Plate XX.).

8. Notes on the Visceral Anatomy of *Lycaon pictus*, and of *Nyctereutes procyonides*. By A. H. Garrod, M.A., F.R.S.

[Received March 18, 1878.]

Having had the opportunity in my prosectorial capacity of dissecting a male specimen of *Lycaon pictus*, as well as several, both male and female, of *Nyctereutes procyonides*, I take the present opportunity of giving the results at which I have arrived.

Lycaon pictus.—This canine animal, so different from its allies in its digitation, is not at all aberrant in its visceral anatomy, which has not been previously described, so far as I am aware. The following are some of the most important details:—

The anterior portion of the palate is black, the pigment extending back as far as half an inch, onto the soft palate, of which the posterior one and a half inch is unpigmented. There is no uvula, a median shallow notch occupying its position. The tonsils are elongate, lunate, and vertical in position.

On the tongue the filiform papillæ are all small; and among them small papillæ fungiformes are sparsely scattered. Three circumvallate papillæ on each side, increasing in size from before backwards, and converging posteriorly, form the normal V. There is no trace of a lytta.

Of the salivary glands the compact submaxillaries are slightly larger than the irregularly shaped parotids. The zygomatic glands are as big as small chestnuts. The accessory submaxillary (or sublingual) glands are situated nearly in contact, in the middle line of the floor of the mouth.

The thyroid gland is formed of two parts, each of the size of a sheep's kidney, these being joined at the inferior internal angle by a narrow isthmus of thyroid tissue. The superior thyroid artery is enormous.

The stomach presented no differences from that of *Canis familiaris*. The following are the lengths of the intestines:—

	ft.	in.
Small intestine	9	1
Cæcum	0	7
Large intestine	1	3

The cæcum is quite caniform, its curves being exactly represented in that of *Canis familiaris*[1].

The liver is deeply fissured, upon the same plan as in all the Canidæ —and all the Carnivora, in fact,—the cystic fissure being very deep, which allows the fundus of the gall-bladder to appear on the diaphragmatic surface of the organ. The left lateral lobe is the largest, the right central and right lateral being slightly smaller. These last are half as large again as the caudate and left central, which are at least four times the bulk of the Spigelian, upon which latter there is a small accessory lobule.

In the generative organs, as in all Canidæ, the prostate is large, whilst Cowper's glands and the vesiculæ seminales are absent. The os penis is large, quite straight, four inches in length, and deeply grooved, as in all the Canidæ, along its lower surface.

In the lungs there are three lobes to the left, and four to the right, one of the latter being azygos. The median lobes of both sides are the smallest; the inferior the largest. The fissures between the lobes are all deep.

The brain of *Lycaon pictus* is perfectly dog-like, resembling that of *Canis lupus* (as figured by Leuret and Gratiolet[2]) in almost every detail, the division of the posterior limb of the gyrus third above the Sylvian fissure extending as far forward on the superior cerebral surface as in that species, or even further, the anterior superior angle of the gyrus next below it being rather more strongly developed. The sulcus between the uppermost (or fourth) gyrus and the third is parallel to the great longitudinal fissure between the hemispheres.

In *Nyctereutes procyonides* the tongue is covered with filiform papillæ smaller in size than in *Lycaon pictus*, allowing the proportionally larger fungiform papillæ to appear more conspicuously among them. These latter posteriorly become the papillæ circumvallatæ, five on each side, larger posteriorly, and arranged in a V-manner.

There is no uvula; and the soft palate embraces the upper end of the larynx with facility.

The stomach is not peculiar, except that it is more than usually muscular at its pyloric end.

In an adult male which died on the 2nd of February last, the father of a litter of six born on May 2nd 1877, the small intestine measured eight feet; the large, one foot and an inch, the cæcum being two inches long, rounded at the end, and slightly turned to the left side apically. It is figured in the accompanying sketch.

In three other specimens, not adult, the following were the intestinal lengths :—

[1] *Vide* P. Z. S. 1873, p. 748, fig. 13.

[2] Anatomie comparée du Système Nerveux (Paris: 1839–1857), pl. iv. fig. Loup.

	♀, half-grown.	♀, a month old.	♀, a month old.
Small intestine	4·25 feet.	5·75 feet.	7·3 feet.
Large intestine	6 inches.	8 inches.	8 inches.
Cæcum	1·25 inches.	1·5 inches.	2 inches.

There is evidently not much constancy in the length of the viscera, even in specimens of the same age and sex.



Cæcum of *Nyctereutes procyonides*.

The liver differs from that of *Lycaon pictus* and other Canidæ in the great size of the Spigelian lobe. In this the accessory lobule, referred to above, is enlarged to form part of the lobe itself, which is, by its presence in a semi-independent condition, rendered bifid apically. In the depth of the cystic fissure, and all other respects, it is quite caniform.

The lungs are not peculiar, the fissure between the left upper and middle lobes only being less developed than in many of its allies. The azygos lobe is present on the right lung.

The prostate is well developed; Cowper's glands are absent, as are the vesiculæ seminales. The os penis is three inches in length, straight, and deeply grooved inferiorly to transmit the urethra. The glans penis is bluntly conical, the urethra opening terminally, much as in the American Cervidæ.

In *Nyctereutes procyonides* the brain is perfectly caniform. The posterior limb of the third convolution is bifurcate, the bifurcating sulcus not being lengthy, going upwards and forward with-

out having any extension directly onwards to the anterior extremity of the hemisphere. There is scarcely any tendency in the second gyrus to form an antero-superior angle; and the sulcus between gyri three and four is not quite parallel to the great longitudinal fissure, it diverging slightly from the middle line as it goes forward. In these respects the brain more resembles that of *Canis vulpes*[1] than those of *Canis familiaris* or *C. lupus*.

In the peritoneal cavity of the adult male *Nyctereutes* (which, like the half-grown female, had excessive atheroma of all its larger arteries) I found an immense number of parasitic worms, collected especially about the abdominal surface of the liver and the stomach.

These worms had "heads" much like those of the *Bothriocephali*, but larger. My friend Mr. F. G. Penrose has most kindly made sections of them, and has demonstrated the existence of a most peculiar cavity in each. This cavity is coiled up within the ovate "head;" its lumen is small; and its walls are plicated very extensively, the magnitude as well as the number of the folds being great. It opens externally at its proximal extremity by one of its ends only. The "body" is tænioid in its proportions, and is not segmented. It is about two and a half inches in total length, the "head" being about the size of a hemp-seed or a little smaller.

There are a few general remarks suggested by the above recorded facts.

First, with reference to the colic cæcum in the Canidæ, I have on a previous occasion noticed the aberrant form of that appendage in *Canis cancrivorus*[2], where it is nearly straight. Two other specimens of the species have since passed through my hands, which have been entirely confirmatory of my earlier observation. In *Nyctereutes procyonides* the cæcum is slightly more caniform than in *C. cancrivorus*; it is a little broader also.

From the examination of other Canidæ, I find that the cæcum, in its twistings, resembles that of *Canis familiaris* in being turned about twice and a half upon itself in *C. laniger*, *C. lagopus*[3], *C. anthus*, *C. fulvus*, *C. antarticus*, *C. azaræ*, *Otocyon lalandii*, and *Lycaon pictus*.

In *Canis aureus* I have found the terminal twist wanting, the apex of the cæcum turning down as in *C. famelicus*.

In *Canis cancrivorus* and in *Nyctereutes procyonides* the cæcum is nearly straight.

Secondly, with reference to the brain, Prof. Flower has done much to condense and classify the facts to be arrived at from the study of the convolutions[4], which latter, in my estimation, throw much light upon the mutual affinities of the Fissiped Carnivora.

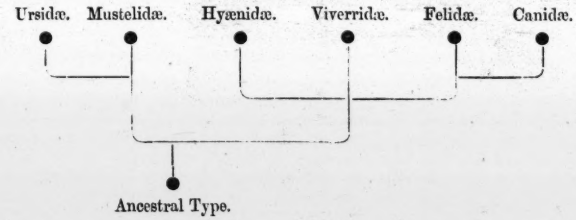
It seems to me that the typical major convolutions of the Carnivorous brain form three complete and uniformly broad gyri round

[1] Leuret and Gratiolet, *loc. cit.* pl. iv. fig. 2, Renard.
[2] P. Z. S. 1873, p. 748.
[3] *Vide* Flower. "Hunterian Lectures," 'Medical Times and Gazette.' London, June 1st, 1872, p. 622.
[4] P. Z. S. 1869, p. 482.

the Sylvian fissure, which in the Mustelidæ and in the Genets remains as such, notwithstanding that these two latter groups had otherwise diverged before the brain began to modify. From the Musteline animals (the Arctoid ancestral type) the Ursidæ seem to have diverged, the superior or third cerebral convolution broadening and tending to divide, whilst the others persist unmodified.

Those Viverridæ which are more modified than the genus *Genetta*, acquire a broadening of the lowest or first circum-Sylvian convolution, especially in its posterior limb, in which a perpendicular sulcus is formed; and this peculiarity is more strongly marked in *Hyæna*, as well as in *Proteles*. In the Felidæ the anterior as well as the posterior limb of this first circum-Sylvian gyrus broadens, and becomes perpendicularly bisected to such an extent that if in them there were a longitudinal sulcus developed in the upper median portion of the gyrus, a complete secondary gyrus would appear. Such a gyrus, evidently thus originating, is found in the Canidæ, in which the extra convolution is therefore a reduplication of the first, dependent on the differentiation off of its outer moiety.

On the assumption of the correctness of this hypothesis, the classification of the Fissiped Carnivora might be represented thus:—



By Prof. Flower[1], after a most careful analysis of their cranial and other peculiarities, the Canidæ are placed between the Arctoidea and Æluroidea; but from the same facts Mr. H. N. Turner[2] placed the three major groups in the same order of sequence that the brain-markings indicate, namely Ursidæ, Felidæ, and Canidæ, which makes it evident that such an arrangement is not opposed to the teaching of the parts other than the cerebral hemispheres.

April 2nd, 1878.

Prof. Newton, F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1878.

The total number of registered additions to the Society's Menagerie during the month of March was 74, of which 32 were by pre-

[1] P. Z. S. 1869, p. 4. [2] P. Z. S. 1848, p. 83.

sentation, 7 by birth, 7 by purchase, 4 were received on deposit, and 24 by exchange. The total number of departures during the same period, by death and removal, was 105.

The most noticeable additions during the month of March were as follows:—

1. An Isabelline Bear (*Ursus isabellinus*, Horsf.), received in exchange from the Zoological Gardens of Calcutta, March 7th. The acquisition of this animal, which has been placed in the Bears' dens next to its near relative the Syrian Bear (*Ursus syriacus*), renders the series of Bears now living in the gardens nearly perfect. It consists of 21 individuals, referable to 11 species, as follows:—

List of Bears living in the Menagerie.

2 Polar Bears ♂, ♀ (*Ursus maritimus*).
4 Brown Bears (*U. arctos*).
1 Hairy-eared Bear (*U. piscator*).
2 Grizzly Bears (*U. ferox*).
1 Syrian Bear (*U. syriacus*).
1 Isabelline Bear (*U. isabellinus*).
3 Himalayan Bears (*U. tibetanus*).
2 Black Bears (*U. americanus*).
3 Malayan Bears (*U. malayanus*).
1 Spectacled Bear (*U. ornatus*).
1 Sloth Bear (*Melursus labiatus*).

2. A Le Vaillant's Darter (*Plotus levaillanti*), purchased March 9. This African species is new to the collection, although we have had several specimens of its American representative (*Plotus anhinga*), and have at present one individual of the latter species living in the fish-house. The present example is probably from Senegal; but this Darter likewise occurs all over Southern and Eastern Africa up to 12° N. lat.[1]

3. Two examples of the very singular Water-tortoise of the Amazons, generally known as the Matamata (*Chelys matamata*), remarkable for the long pendent filaments on its neck. The larger of the two measures about 13¾ inches in length.

This species is new to the collection, and, so far as I know, has not been previously brought alive to Europe.

I take this opportunity of recording the fact that the large female Anaconda (*Eunectes murinus*), which was purchased on the 15th February, 1877, and which (as I stated P. Z. S. 1877, p. 303) began to produce young (dead) the 2nd April, 1877, continued to produce young Snakes (mostly in a more or less decomposed condition) up to about three months since, when fifteen finally came forth. In all sixty-two young were produced.

This Snake is further remarkable for its long fast. Up to the 15th March, when she killed and ate a single duck, all offers of food were refused; so that she must have fasted thirteen months.

[1] Cf. Finsch & Hartl. Vögel Ost-Afrika's, p. 841.

It is impossible to *say* how long she may have been without food previous to her arrival at the gardens. One thing is certain, however, that she could not have taken food while in the box in which she arrived from South America, as she was so closely packed as to be barely able to move.

The following papers were read :—

1. Contributions to the Ornithology of the Philippines. No. VII.—On the Collection made by Mr. A. H. Everett in the Island of Panaon. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received March 6, 1878.]

The small collection, of which it is proposed to give an account, was made by Mr. Everett at San Francisco, on the west coast of the small island of Panaon. This island is situated to the south-east of Leyte, from which it is separated by a narrow channel. Nor is its southern extremity distant from the most northerly part of Mindanao.

The number of species obtained is too small to permit me to draw any general conclusions as to the affinities of its ornis. But the occurrence of the Leyte species of *Buceros* and *Thriponax*, *B. semigaleatus* and *T. pectoralis*, rather than those of Mindanao, indicates a closer affinity to the northern than to the southern island.

Panaon has never hitherto been visited by an ornithological collector.

1. Cacatua hæmaturopygia (1).

[Panaon, ♀, October.]

2. Prioniturus discurus (2).

[Panaon, ♂, October.]

3. Thriponax pectoralis.

Thriponax pectoralis, Tweeddale, *anteà*, p. 340.

[Panaon, ♂, ♀, October.]

4. Chrysocolaptes lucidus (32).

[Panaon, ♀, October.]

Crest and crown dark brown, with ruddy fulvous spots.

5. Eurystomus orientalis (37).

[Panaon, ♂, ♀, September.]

6. Entomobia gularis (44).

[Panaon, ♂, ♀, October.]

7. Buceros semigaleatus.

Buceros semigaleatus, Tweeddale, *anteà*, p. 277.

[Panaon, ♂, ♀, October.]

8. Lanius lucionensis (72).

[Panaon, ♂, ♀, October.]

Several of the examples from Panaon have the whole head above coloured like the back, uniform liver-brown. There are females with brown-freckled breasts and flanks.

9. Graucalus striatus (74).

[Panaon, ♂, ♀, October.]

10. Dicrurus striatus.

Dicrurus striatus, Tweeddale, P. Z. S. 1877, p. 545.

[Panaon, ♂, ♀, October.]

11. Broderipus acrorhynchus (90).

[Panaon, ♂, October.]

12. Mixornis capitalis.

Mixornis capitalis, Tweeddale, *anteà*, p. 110, pl. vii. f. 2.

[Panaon, ♂, September.]

13. Poliolophus urostictus (101).

[Panaon, ♀, October.]

14. Hypsipetes philippinensis (102).

[Panaon, ♀, October.]

15. Criniger everetti.

Criniger everetti, Tweeddale, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 535.

[Panaon, ♂, September and October.]

16. Monticola solitarius (103).

[Panaon, ♂, ♀, October.]

17. Corydalla lugubris (117).

[Panaon, ♂, October.]

18. Dicæum modestum, n. sp.

[Panaon, ♂, October.]

Above dull olive-brown. Upper tail-coverts and outer margins of the wing-feathers a brighter olive-green. Rectrices above dark brown, some narrowly edged with olive-green. Cheeks greyish brown. Chin and throat greyish white. Breast pale grey. Abdomen, ventral region, and under tail-coverts faint yellowish white.

Axillaries, wing-lining, and shoulder-edge pure white. Bill, in dried skins, black.

Wing 1·95, tail 1·00, tarsus 0·37, culmen 0·37.

This Flower-pecker closely resembles *Myzanthe pygmæa* ♀. It differs in wanting the lively olive-green colouring of the upper plumage of *M. pygmæa* ♀, more especially on the uropygium, and the pale yellowish-green lores. The wing too is longer, that of *M. pygmæa* measuring 1·70. If the sex noted on the label is correct, this Panaon *Dicæum* is very distinct from *M. pygmæa* ♂. If the genus *Myzanthe*, as distinct from *Dicæum*, is to be retained, *D. modestum* should belong to it.

19. Corvus philippinus (125).

[Panaon, ♂, October.]

20. Phabotreron amethystina (139).

[Panaon, ♀, September.]

2. Description of new Lepidoptera of the Group Bombycites, in the Collection of the British Museum. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Received March 8, 1878.]

The following species are believed to be new to science:—

Agaristidæ.

Eusemia, Dalman.

1. Eusemia incongruens, n. sp.

♂. General aspect of *E. africana*, but the primaries with the first ochreous spot interrupted in the centre; three ochreous dots in the form of a triangle behind them; the abbreviated subapical belt much broader, and not notched at its infero-anterior edge; the spot at external angle of twice the size; secondaries reddish orange, with the usual black border. Expanse 2 inches 8 lines.

♀. Spots of primaries paler than in the male; secondaries stramineous, with a much narrower black border. Expanse 2 inches 8 lines. Abyssinia.

Arctiidæ.

Pionia, Walker.

2. Pionia calopteridia, n. sp.

Primaries purplish black, crossed by two broad yellowish bands, the first basal, the second discal and laterally bisinuate; secondaries hyaline-white, tinted towards the borders with fuliginous brown;

veins towards the base yellow; head, collar, and thorax purplish black, tawny or ochraceous at the sides; abdomen fuliginous brown, ochraceous at the sides; wings below more clearly defined than above, the costal borders alternately black and yellow; palpi and legs black and yellow; venter yellowish. Expanse, ♂ 1 inch 3 lines, ♀ 1 inch 2 lines. ♂, Pará; ♀, Venezuela (*Dyson*).

The species of this genus are marvellous mimics of the Coleopterous genus *Calopteron*.

Alpenus, Walker.

3. Alpenus purus, n. sp.

Wings snow-white; primaries with one black dot at base, one near the base of the median vein, two before the middle of costal margin, three in a triangle on interno-median interspace, and five in a curved series beyond the middle; secondaries with a spot at the end of the cell, one near the outer margin, and two near the anal angle; thorax snow-white, with a black dorsal line; collar and tegulæ spotted with black; abdomen ochreous, with a dorsal series of black spots, anus and ventral surface cream-coloured: primaries below without spots. Expanse 1 inch 7 lines. Abyssinia.

This species much resembles *Spilosoma menthastri*, but with the smooth black-spotted thorax of *Alpenus*.

Teracotona, n. gen.

Allied to *Phragmatobia*, but with longer and narrower primaries, the last subcostal branch with a single instead of a double furca; discocellulars distinctly angulated; secondaries more acuminate at apex; subcostal branches emitted from a very short footstalk; discocellulars more transverse, less distinctly angulated; radial emitted further from the third median branch; body much less woolly. Type, *Aloa rhodophæa* of Walker.

4. Teracotona roseata, n. sp.

Primaries above reddish testaceous speckled with brown; a black discocellular spot and a subcostal spot near apex; secondaries rose-red, brightest on the abdominal area; a large black discocellular spot; thorax grey; head, front of collar, and inner edge of tegulæ brownish buff; a black spot on each shoulder, and one on each tegula; abdomen black, rosy at the base, a dorsal stripe, the posterior margins of the segments and the anus ochreous: wings below rosy, with black discocellular spots; borders testaceous, speckled with pale brown; primaries with an irregular transverse dusky discal belt; body below whity-brown; anterior femora above carmine, knees black, tarsi banded with black; venter ochreous at the sides, with two lateral series of black spots. Expanse 2 inches 2 lines. Natal (*Gueinzius*).

Allied to *T. submacula* (*Spilosoma submacula*, Wlk., = *Spilosoma obscurum*, Wlk.), but with longer wings, and differently coloured.

Phaos, Walker.

5. Phaos vigens, n. sp.

Primaries dark chocolate-brown with cream-coloured margins; a discoidal streak broken into three nearly equal spots, an apical costal spot, and an angulated stripe beyond the middle (its inferior extremity terminating at the centre of the interno-median interspace in an acute spur) cream-coloured: secondaries ochreous, whitish upon costa, rosy at abdominal border; a black discocellular spot and a broad regular external black border; fringe cream-coloured: head blackish, with cream-coloured frons, collar pale ochreous; tegulæ blackish-brown fringed with pale ochreous; thorax blackish; abdomen rose-red, with a dorsal row of black dots; anus ochreous; wings below with all the paler areas broader and pale clear ochreous; body below pale ochreous, varied with blackish; anterior femora above carmine. Expanse 1 inch 4 lines. Tasmania.

We have four examples of this species, which Walker confounded with his *P. fascinula*, as he did also the four following.

6. Phaos nigriceps, n. sp.

♂. Allied to the preceding; primaries black-brown, the base, a furcate streak from the base, the apical two-thirds of costal margin, a triangulated discal stripe, an interrupted submarginal line, and the fringe cream-coloured; base of costa with a tuft of rosy hairs; secondaries rosy, with black discocellular spot, a broad black external border and ochreous fringe; head and thorax black, collar and anterior margins of tegulæ dull buff; abdomen rose-red, with transverse dorsal black bars and lateral black spots: under surface with the pale portions buff; anterior femora above carmine. Expanse 1 inch 6 lines.

♀. Basal furca of primaries only represented by a basal dash and a spot in the cell, discal stripe and submarginal line much more slender; pale portions below rosy. Expanse 1 inch 4 lines.

♂. Victoria (*Bakewell*); Sydney (*Doubleday*).

Readily distinguished from *P. fascinula* by its black head; in marking it is nearer to *P. vigens*.

7. Phaos notatum, n. sp.

♂. Primaries above dark chocolate-brown; a longitudinal dash from the base to near the middle of the cell, a broad streak from the base to the centre of the inner margin, a subquadrate spot at the middle of the costal margin, a spot below the latter intersected by the origins of the median branches, a curved macular discal stripe, the apical portion of costal margin, the fringe, and a submarginal series of spots (of which the first, second, and fifth are small, the others elongated and extended to the margin) cream-coloured: secondaries rosy with whitish costal area; a large black discocellular spot; a broad irregular black submarginal belt; thorax black, head, collar, and borders of tegulæ clothed densely with testaceous hair: body bright rose-red, with black dorsal and lateral spots: under

surface yellower than the upper, the dark areas and markings paler. Expanse 1 inch 6 lines. Sydney.

As might be expected, this species is nearly allied to *P. fascinula*, from the Hunter River; it may, however, readily be distinguished by the broad testaceous fringes to the tegulæ and the marking of the primaries.

8. PHAOS NEXUM, n. sp.

♂. Primaries black-brown; the base, an abbreviated internal streak, a quadrate spot in the cell, an abbreviated acutely angulated central band from the costa to the first median branch, an angulated discal stripe, and a broad external border enclosing a submarginal series of black spots cream-coloured; secondaries rosy, a black discocellular spot and a broad black submarginal belt, outer margin ochreous; thorax black; head, collar, and fringes of tegulæ buff; abdomen rose-red with dorsal and lateral black spots: wings below much yellower than above, the black portions slightly paler. Expanse 1 inch 4 lines. Victoria (*Bakewell*).

This species is chiefly distinguishable by the abbreviated angulated central belt, and the discal stripe almost uniting with the external border.

9. PHAOS LACTEATUM, n. sp.

Primaries cream-coloured; a nearly central angulated broad black belt, not reaching the margins, and interrupted by an irregular spot upon the median vein; a black sinuous costal stripe from the base, only separated from the black band by the subcostal vein; an oblique blackish basal streak; four black spots in a discal series before apex, and three in a pyramidal form near external angle: secondaries rose-red, with ochraceous borders; a black discocellular spot and a confluent series of unequal discal spots parallel to the outer margin: thorax black; head, collar, and fringes of tegulæ sordid buff; abdomen rose-red, with dorsal and lateral series of black spots. Under surface with the costal and internal borders tinted with rose-colour; the broad belt of primaries greyish; body below cream-coloured spotted with black; femora carmine in front, tibiæ and tarsi grey. Expanse 1 inch 6 lines. Moreton Bay (*Damel*).

This is a very distinct-looking species, and more like a typical *Arctia* than any of the other forms in the genus.

LITHOSIIDÆ.

CISTHENE, Walker.

10. CISTHENE NIVEATA, n. sp.

Primaries snow-white, sprinkled sparsely with dark brown scales; a dark brown spot at base, and a second on inner margin: secondaries with the basal half rosy whitish at costa, external half greyish brown: head and thorax white, abdomen rose-coloured: primaries below greyish brown, body below white. Expanse 8 lines.

Espiritu Santo.

Mæpha, Walker.

11. Mæpha ditis, n. sp.

Primaries bright yellow, with the veins and two marginal lines carmine; base and outer border sparsely sprinkled with black scales; two parallel irregular transverse black lines, the first central, the second discal; secondaries pink with white fringe; head and thorax bright yellow, tegulæ edged internally with carmine; abdomen pink: primaries below rosy with yellow borders and traces of two greyish transverse belts; body below cream-coloured, anterior legs and palpi rose-coloured. Expanse 6 lines. Espiritu Santo.

Barsinella, n. gen.

Allied to *Barsine* (section of *Miltochrista*), but the wings comparatively much broader, shorter, and more densely scaled; the costal margin of the primaries angulated, the under surface of these wings crossed at the end of the cell by a perfect fence of long convergent hairs; the costal margin of primaries with a central fringe of long hairs, the last two or three segments of the abdomen densely fringed with hair.

Type, *B. mirabilis*.

12. Barsinella mirabilis, n. sp.

Primaries bright cadmium yellow, two black spots at the base, a ≤-shaped marking near the base, two irregular parallel central lines, and a discal series of dots black, a G-shaped marking at the end of the cell and the outer margin carmine, fringe golden yellow;



Barsinella mirabilis.

secondaries rose-red; head and thorax cadmium-yellow, a black spot on each shoulder; abdomen whitish: primaries below yellow, the basal half of costal border and a discal series of dots black; secondaries paler than above; body ochraceous. Expanse 7 lines. Espiritu Santo.

Nyctemeridæ.

Aletis, Hübner.

13. Aletis tenuis, n. sp.

Wings fulvous, semitransparent; primaries with the costal and external margins and a broad subquadrate apical patch enclosing a

large oblique oval white spot black; secondaries with the apex and a more or less confluent marginal series of dots at the terminations of the nervures black; body yellow, banded with black. Expanse 1 inch 9 lines. Dar-es-Salem, Zanzibar (*J. & F. Moir*).

A delicate little species, resembling the New-world genus *Stenele*.

14. ALETIS VARIABILIS, n. sp.

♀. Ochreous; primaries with the apical two fifths blackish, enclosing a large transparent white patch beyond the cell, and two smaller pyriform spots on the median interspaces; secondaries with a regular blackish border enclosing nine transparent white spots, most of which touch the outer margin; body greyish, spotted with white. Expanse 2 inches 3 lines. Ambriz (*Monteiro*).

♀. Var. *a*. Primaries with the pyriform spots elongated into ellipses which distort the blackish border, also a third bifid spot below them completely interrupting the border near the external angle; secondaries with the white marginal spots confluent and breaking through the border at apex. Ambriz (*Monteiro*).

♂. Var. *b*. Primaries with all the white spots confluent, forming a large irregular hyaline patch which almost covers the disk; secondaries with the inner edge of the marginal border only traceable near the anal angle, the white spots expanded into a broad hyaline belt, which widens gradually to the costa.

Angola, Bembe Mines (*Monteiro*).

A. variabilis is much like *Stenele lutescens*.

The other species of *Aletis* in the Museum were all placed by Mr. Walker under *A. helcita*, to which they are allied. They are as follows:—

1. *A. libyssa*, Hopffer, from Natal and the Zulu country.
2. *A. fascelis*, Linnæus, from the Congo.
3. *A. helcita*, Clerck, from Western Africa (exact locality unknown).
4. *A. druryi* = *A. helcita*, Drury, Ill. iii. pl. 29. f. 4. Sierra Leone.
5. *A. macularia*, Fabricius, from Ashanti.

Of these forms *A. libyssa* is the most decidedly distinct, the others are mere local modifications of one type differing from one another in the size and number of the white spots of primaries and the width of the black border of secondaries. Cramer's *A. helcita* is the same as that figured by Drury.

DEILEMERA, Hübner.

15. DEILEMERA SIGNATA, n. sp.

Allied to *D. artemis*, Boisd., and *D. pellex*, Linn. (*Nyctemera separata*, Wlk.), but smaller than either, with the broad white postmedian patch of primaries reduced to a quarter the size, and with the dark border of secondaries of double the width. Expanse 1 inch 7 lines. Darnley Island (*Dr. W. Y. Turner*).

CHALCOSIIDÆ.

POMPELON, Walker.

16. POMPELON AMPLIATUM, n. sp.

♀. Near to *P. marginatum* from Penang, but larger, the primaries with narrower and duller blue apical border, its inner margin dentate-sinuate; blue apical patch of secondaries extending further up the costal area; yellow spot on under surface of primaries oval and of double the size; the metallic green costal shot only traceable upon the veins, and even there of a duller bluish tint; ventral surface of abdomen with the black spots about eight times as large. Expanse 2 inches 8 lines. Celebes, near Macassar (*Wallace*).

LIPARIDÆ.

MORASA, Walker.

17. MORASA LORIMERI, n. sp.

Allied to *M. modesta* (*Sarothropyga rhodopepla* of Felder), but the primaries black mottled with whity brown, with the outer border and a biangulated discal belt of whity-brown scales, veins spotted with orange; secondaries pink, with a broad greyish outer border not quite reaching the anal angle, fringe sordid rosy; head and thorax black; abdomen rose-red with lateral tufts of ochreous hair: primaries below smoky grey, with the base ochreous; secondaries rather paler than above; body blackish, clothed with testaceous hairs; femora rose red. Expanse 1 inch 9 lines.

Tugela river, Natal.

This species was sent to me in a letter by my cousin Miss J. K. Lorimer, who caught it near the Gordon Mission station.

NOTODONTIDÆ.

ROSEMA, Walker.

18. ROSEMA FULVIPENNIS, n. sp.

♀ Primaries dull emerald-green with orange costal margin; fringe white, tipped with plum-colour and with two apical spots of the same colour, a snow-white spot at the end of the cell; secondaries bright fulvous (almost orange); thorax green, frons white, with two fulvous spots; palpi ochreous; collar chocolate-brown; abdomen fulvous: under surface bright yellow with broad reddish-orange costal borders; primaries with the outer border pale shining pinky brown; secondaries with the apical half reddish orange; legs above brownish. Expanse 1 inch 9 lines. St. Paulo (*Bates*).

Allied to *R. dorsalis*, *zelica*, *myops*, and *costalis*.

SATURNIIDÆ.

COPAXA, Walker.

19. COPAXA GEMMIFERA, n. sp.

General pattern of *C. expandens* from Venezuela, but smaller and

with more acuminate primaries; above bright stramineous, the external area densely irrorated with red-brown scales, but leaving clear yellow patches or spots behind a submarginal series of small black spots, which are partly united by a zigzag dusky line; a straight dark brown stripe from the apex of primaries to the middle of the abdominal margin of secondaries; a very irregular dark brown line across the basal area; a small tricoloured ocellus (white, black, and yellow) with hyaline centre in the middle of each wing; primaries with the basal half of costal border lilacine grey, a broad dark brown longitudinal belt from the base to the straight oblique discal stripe, an irregular dentate-sinuate brown line from the costa to the inner margin just beyond the ocellus, a curved dark brown streak from the costa to the oblique stripe, two grey-edged apical white spots; secondaries with a regular dentate-sinuate brown line just beyond the ocellus; head, collar, and tegulæ grey; palpi and prothorax plum-coloured: wings below altogether paler than above, the markings less defined, the dark longitudinal belt of primaries obsolete; body below pale yellow, the anterior tibiæ and tarsi plum-coloured. Expanse 3 inches 8 lines. Ambriz (*Monteiro*).

We also have what seems to be a faded example of this species from Lake Nyassa; the latter, however, differs somewhat in marking, and may prove to be locally constant.

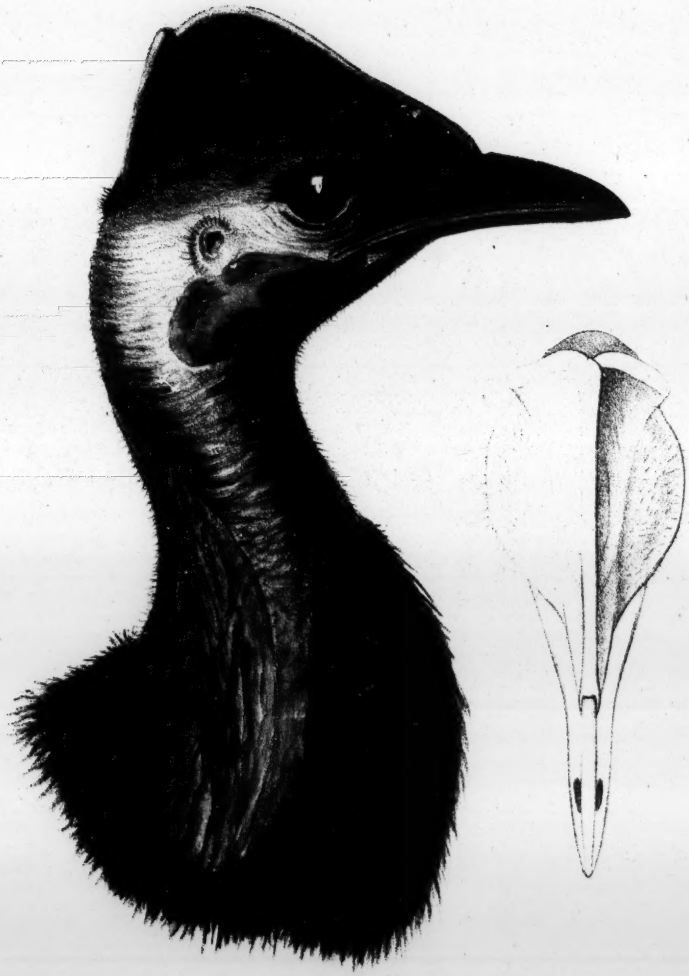
Attacus, Linnæus.

20. Attacus pryeri, n. sp.

Allied to *A. walkeri* of Felder from N. China, but darker than any of the species of the *A. cynthia* group; olive brown, with paler borders and the usual submarginal lines; the pale belt (bounding the dark angulated central line externally) white inwardly, pinky whitish and diffused outwardly, with no defined intersecting stripe as in all the allied species; the maggot-like markings, basal white belts, and the apical markings of primaries as in *A. walkeri*. Expanse, ♂ 5 inches 10 lines, ♀ 6 inches 2 lines.

Yokohama (*Jonas*).

This species is the most undeniably distinct of all the forms allied to *A. cynthia*. I name it after Mr. H. Pryer, of Yokohama. *Attacus cynthia*, as figured by Drury, does not agree with Felder's Chinese species, but is certainly nearest to the form occurring in Java, to which Mr. Moore has given the name of *A. insularis*. It may eventually prove to be distinct from the latter, from which it appears to differ in the more angulated central transverse line; in all other characters, such as colour, the strongly dentate pale belt, and the bent form of the maggot-like marking of the primaries, it is extremely like the Javan form.



F.Oustalet del. J.Smit. Lith.

CASUARIUS EDWARDSI.

3. Description d'une nouvelle espèce de Casoar (*Casuarius edwardsi*). Par M. E. Oustalet.

[Received March 12, 1878.]

(Plate XXI.)

Parmi les animaux rapportés par MM. Raffray et Maindron de leur récent voyage en Nouvelle Guinée et acquis par le Muséum d'histoire naturelle de Paris se trouvent deux Casoars parfaitement adultes. Le premier de ces oiseaux, tué à Salwatty, en juillet 1877, est certainement le *Casuarius uniappendiculatus*, Blyth; l'autre, pris à la même époque aux environs de Dorey, ressemble au premier abord au *Casuarius papuanus*, von Rosenb., auquel j'avais été primitivement tenté de le rapporter, mais il me paraît différer essentiellement de cette espèce par la forme de son casque. M. Schlegel dit en effet (Nederl. Tijd. v. d. Dierk. iv. 53) que le *Casuarius papuanus* a le casque modelé comme le *Casuarius uniappendiculatus*. Or dans ce dernier dont j'ai, comme je l'ai dit tout-à-l'heure, un individu adulte sous les yeux, le casque est en pyramide assez élevée, la face postérieure, ovale, aplatie, étant *fortement inclinée*, les faces latérales planes étant disposées en toit, le point culminant du casque se trouvant *bien en avant de l'œil*, et l'arête antérieure descendant brusquement de ce point vers le bec. Le même type de casque s'observe également dans le *Casuarius kaupi* et dans le *Casuarius westermanni* figurés par M. Sclater (Proc. Zool. Soc. 1872, p. 148 et pl. ix., et 1875, pl. xix.). Du reste, dans une lettre qu'il m'a fait l'honneur de m'écrire il y a peu de jours, M. Salvadori affirme que le *Casuarius westermanni* ne diffère point du *Casuarius papuanus* qui habite les environs de Dorey; et, d'un autre côté, M. Sclater a réuni récemment (Proc. Zool. Soc. 1875, p. 85, note) son *Casuarius kaupi* (qui n'est pas celui de M. von Rosenberg) à son *Casuarius westermanni*.

Si, comme le dit M. Schlegel, et comme cela semble probable d'après l'opinion exprimée par M. Salvadori, le *Casuarius papuanus* a le casque de la même forme que le *Casuarius uniappendiculatus* et le *Casuarius westermanni*, il est tout-à-fait impossible de rapporter à la première de ces espèces (*C. papuanus*) l'individu provenant du voyage de MM. Raffray et Maindron. Dans ce Casoar en effet, dont je donne une figure aussi exacte que possible, exécutée d'après un croquis fait par M. Maindron à la Nouvelle Guinée, immédiatement après la mort de l'animal, le casque, relativement peu élevé, et fort étroit, se confond presque par sa base avec la tête sur laquelle il repose : sa face postérieure, au lieu d'être aplatie et fortement inclinée, est légèrement excavée et *s'élève presque verticalement*; elle est en outre un peu échancrée à son bord supérieur, au point où aboutit l'arête formée par la jonction des deux faces latérales. Celles-ci sont faiblement bombées et se rencontrent suivant une ligne qui partant de la dépression signalée sur le haut de la face

postérieure, remonte jusqu'à un point situé au-dessous de l'oreille et redescend ensuite, en décrivant une légère sinuosité, mais en pente très-douce, vers le bec, qui est séparé du casque par un petit sillon transversal. Il résulte de cette disposition que le point culminant du casque n'est placé non plus comme dans le *Casuarius uniappendiculatus* en avant de l'œil, *mais notablement en arrière*. On peut noter encore que les faces latérales du casque se prolongent en pointe sur les côtés de l'arête supérieure du bec, comme on le voit dans la figure ci-jointe. Somme toute, le casque présente à peu près le même aspect que dans le *Casuarius bennetti* et, vu en-dessus, offre deux arêtes que se coupent à angle droit. La coloration des parties nues n'est pas non plus exactement celle qui est indiquée par M. Schlegel (Mus. des Pays-Bas, Struthiones, et Nederl. Tijds. *loc. cit.*) pour son *Casuarius papuanus*, les taches rouge-carmin qui occupent les côtes du cou, au-dessous des yeux et des oreilles, ne s'étendent pas jusqu'à la tache rouge-orangée qui couvre la nuque, et sont separées de celle-ci par une teinte bleue; en outre la tache rouge-orangée se prolonge inférieurement sous forme de bandes latérales, lisérées de bleu en avant. Mais ce sont là des différences plus légères que celles que l'on constate dans la forme du casque. Ces dernières me paraissent suffisantes pour autoriser la création, en faveur de ce Casoar, d'une espèce nouvelle que je proposerai de nommer *Casuarius edwardsi*.

Le type de ma description est un mâle, adulte, tué, m'a-t-on affirmé, auprès de Dorey, sur la côte septentrionale de la Nouvelle Guinée.

En terminant je ne puis m'empêcher d'exprimer le désir de voir un ornithologiste publier une monographie complète du groupe si intéressant des Casoars, dont les espèces sont encore si mal définies, et n'ont pas été complétement figurées jusqu'à ce jour.

4. On an apparently new Species of American Pipit. By Francis Nicholson, F.Z.S. &c.

[Received March 28, 1878.]

During a recent examination of the American Pipits in the British Museum I came across two skins from Peru, labelled *Anthus chii*, which appear to me to be specifically distinct from that bird; and I therefore propose to name the species

Anthus peruvianus, n. sp.

A. *Similis* A. chii *auct.* (A. rufo, *Gm.*) *sed dorsi plumis et tectricibus alarum latè albo nec fulvescenti marginatis; corpore subtus albido nec flavicante, et præcipuè caudæ colore distinguendus; rectricibus duabus externis pallidè fumoso-brunneis, intus obliquè saturatiùs brunneis ad apicem ipsum albidis et versus apicem pogonii externi saturatiùs brunnescentibus.*

Long. tot. 5·1, *culmen* 0·5, *alæ* 2·45, *caudæ* 1·75, *tarsi* 0·8.

Adult male. Lark-like. Above dark brown, the feathers exter-

nally edged with dull sandy buff; the dorsal feathers dull whitish on their inner webs, producing a distinctly varied appearance: scapulars more uniform, the longer feathers with a subterminal shade of dark brown, the edges and tips being dull sandy buff; lower back and rump also rather more uniform than the rest of the back, only slightly mottled with dark brown subterminal spots: tail-feathers dark brown with nearly obsolete edges of sandy-buff, the two middle feathers margined with ashy whitish; the two outside feathers smoky brown with a faintly indicated oblique mark of darker brown on the inner web, the tips white, and the outer web distinctly darker brown towards the tip: least wing-coverts like the back; median and greater series blackish brown, very broadly edged with dull whitish; primary-coverts and primaries dark brown, narrowly edged with yellowish buff, the first long primary dull white for nearly the entire length of the outer web; secondaries brown with a tiny white tip and externally edged with dull white and sandy buff: lores and a distinct eyebrow dull whitish; ear-coverts brown, washed with sandy buff, tipped with darker brown, with whitish shafts; cheeks and under surface of body dull white, tinged with buff on the cheeks and breast; throat and abdomen uniform, the chest marked with triangular spots of brown; a distinct moustachial streak of brown; sides of body washed with fulvous brown and longitudinally streaked with dark brown; thighs and under tail-coverts buffy white; under wing-coverts and axillaries white, the edge of the wing mottled with tiny brown spots; quills brown below, whitish along the inner web; bill horn-brown, the under mandible paler; legs waxy yellow.

Hab. Peru.

Syn. Anthus rufus, Sclater & Salvin, P. Z. S. 1868, p. 173.
Anthus chii, Taczanowski, P. Z. S. 1874, p. 506.

This species is of the same small size as the bird called in the British Museum and by most ornithologists *A. chii*, but more correctly by Messrs. Sclater and Salvin *A. rufus*. It is not so yellow below; and this is a point that strikes the observer at once. On comparing the upper surfaces the white edgings of the wing-coverts and dorsal feathers in *A. peruvianus* are very noticeable. But the chief difference lies in the outer tail-feathers, which are white in *A. chii*, smoky brown in *A. peruvianus*. The oblique mark of dark brown on the inner web is distinct in the former, nearly obsolete in the latter. Both species have a brown mark near the tip of the outer web.

The typical specimens were collected by Mr. Henry Whitely in Peru, the male in the Cataridon valley on the 12th of February 1867, the female at Islay on the 17th of the same month.

E. W. H.

Mr. Sclater exhibit
described by Mr. W.
Vulpes cana, from Bal
him for examination.
species appeared to be
Zoology of Persia ('
with doubt, after exan
Gardens, to *Canis fa*
investigate this point.
Blanford with the an
no. 213 *b*, p. 62), whi
showed that the two a

Mr. Sclater was ind
note upon these differ

"Blanford's *Vulpe*
at the Gardens, which
of the back is dark wi
grizzled with black o
back; and the outside
fulvous. The differe
ments of the skeleton
taken to correspond w

Length of sku	
Length of sku	
Length of nas	
Breadth of na	
Breadth of fro	
Breadth of br	
Breadth of zy	
Length of pal	
Breadth of pa	
Length of last	
Length of firs	
Breadth of fir	
Length of hu	
Length of rad	
Length of fem	
Length of tibi	

Mr. E. G. Loder,
peculiar variety of
Bison"[2], remarkable

[1] No 213 c
[2] Allen's M

April 16, 1878.

. W. H. Holdsworth, F. Z. S., in the Chair.

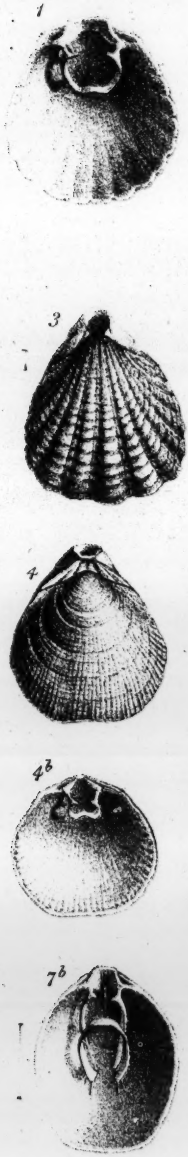
r exhibited a typical specimen of the new Fox lately Mr. W. T. Blanford (J. A. S. B. xlvi. pt. ii. p. 321) as from Baluchistan, which Mr. Blanford had forwarded to ination. Mr. Blanford having stated (*l. s. c.*) that his red to be the same as the small Bushire Fox which in his Persia ('Eastern Persia,' vol. ii. p. 41) he had referred fter examining a young specimen living in the Society's *Canis famelicus*, Rüpp., had requested Mr. Sclater to is point. But the comparison of the skin sent by Mr. n the animal referred to by him ('List of Vert.' 1877, 62), which was still living in the Society's Gardens, the two animals must belong to quite different species. r was indebted to Mr. E. R. Alston for the subjoined ese differences:—

's *Vulpes cana* is quite different from your *C. famelicus* ns, which is much larger and lighter in colour. The fur s dark with light tips, forming a nearly uniform grey black *only* on the shoulders. The nape is like the e outsides of the ears appear nearly black; the limbs are ne difference in size is shown in the following measure- skeleton of the specimen of the same animal that died[1], respond with those given by Blanford.

	inches.
th of skull from occipital crest	5·45
th of skull from foramen magnum	5·0
th of nasal bones	1·80
dth of nasal portion	·75
dth of frontal region	·75
dth of brain-case	1·60
dth of zygomatic arches	2·95
th of palate	2·60
dth of palate	·75
th of last upper prem.	·52
th of first molar	·40
dth of first molar	·45
th of humerus	4·40
th of radius	5·0
th of femur	4·90
th of tibia	5·10

. Loder, F.Z.S., exhibited a mounted head of the iety of *Bos americanus*, called the "Rocky-Mountain narkable for its soft, dark and long hair on the forehead.

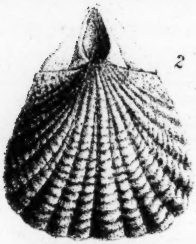
[1] No 213 *c* of 'List. of Vert.' (1877) p. 62.
[2] Allen's Memoir on the American Bison' pp. 39, 40.

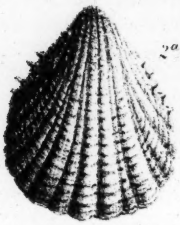


Tho.s Davidson del. et lith.

B

'LIGHTNIN

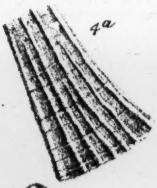


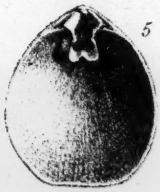






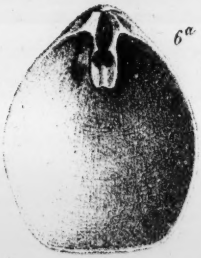


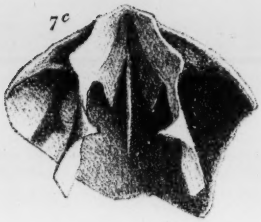








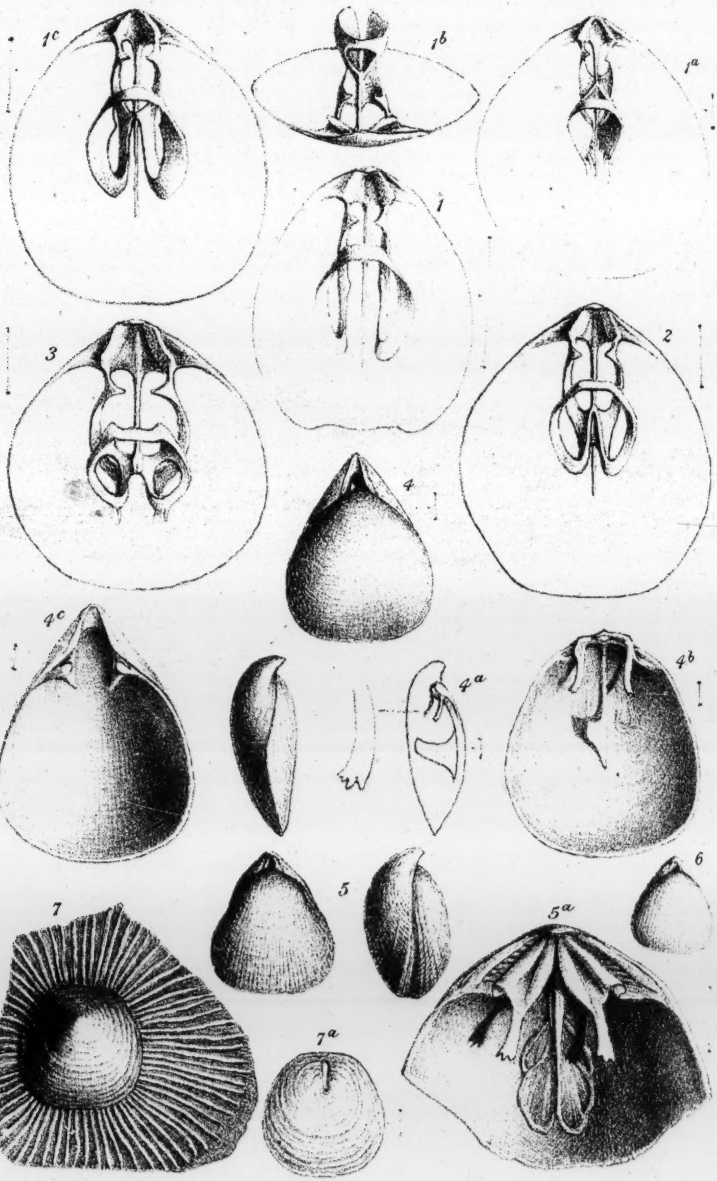






Hanhart imp.

BRACHIOPODA OF THE
HTNING" & "PORCUPINE" EXPEDITIONS.



Thos Davidson del. et lith.

Hanhart imp.

BRACHIOPODA OF THE
"LIGHTNING" & "PORCUPINE" EXPEDITIONS.

This specimen had been obtained about 75 miles from Denver, Colorado, in 1875.

The Secretary exhibited, on the part of Mr. A. Anderson, F.Z.S., a Bamboo driving-stick with leather thong attached, which had been taken out of the nest of an Indian Fish-Eagle (*Haliaëtus leucorycphus*) in December 1876.

A communication was read from Prof. J. O. Westwood containing a synopsis of the Uraniidæ, a family of Lepidopterous Insects, together with a complete monograph of *Coronilia*, one of the genera of which it is composed.

This memoir will be published entire in the Society's "Transactions."

The following communications were read:—

1. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868–70. (Part I.) By J. Gwyn Jeffreys, LL.D., F.R.S., F.Z.S.

[Received April 5, 1878.]

(Plates XXII., XXIII.)

These expeditions were conducted under the auspices of the Royal Society; and preliminary Reports of them were published in the 'Proceedings' of that Society for 1869 and 1870.

I subjoin lists of the dredging-stations, to which I shall have occasion to refer in giving the habitats of the species hereafter described or mentioned. The stations are extracted from the Reports and accompanying Charts.

'Lightning' Expedition, 1868.

North of the Hebrides to the Faroe Isles.

No. of Station.	No. in Chart.	North Latitude.	West Longitude.	Depth in Fathoms.	Bottom Temperature.
		° ′	° ′		° Fahr.
1.	VIII.	60 10	5 59	550	32·8
2.	IX.	60 24	6 38	170	41·7
3.	X.	60 28	6 55	500	33·2
4.	XII.	59 36	7 20	530	47·3
5.	XIII.	59 5	7 29	189	49·6
6.	III.	60 31	9 18	229	48·0
7.	XVI.	61 2	12 4	650	
8.		Off the Faroe Isles.		164 & 208	

The first column shows the stations at which dredgings were made,

and the second shows the corresponding stations in the chart; other stations, at which soundings only were taken, are omitted.

'Porcupine' Expedition, 1869.

First Cruise.

Off the West of Ireland.

No. of Station.	North Latitude.	West Longitude.	Depth in Fathoms.	Bottom Temperature.
				°Fahr.
1.	51° 42′	11° 21′	85–110	49·0
	Dingle Bay.		30–40	
2.	51 22	12 25	808	41·4
3.	51 38	12 50	370–722	43·0
4.	51 56	13 39	251–539	49·5
5.	52 7	12 52	364	48·8
6.	52 25	11 40	90	50·0
7.	52 14	11 48	159	50·4
8.	53 15	11 51	106	51·2
9.	53 16	12 42	165	49·7
10.	53 23	13 29	85	49·5
	Galway Bay.		15–20	
13.	53 42	13 55	208	49·6
14.	53 49	13 15	173	49·6
15.	54 5	12 17	422	47·0
16.	54 19	11 50	816	39·5
17.	54 28	11 44	1230	37·8
18.	54 15	11 9	183	49·4
	Donegal Bay.		25–40	
19.	54 53	10 56	1360	37·4
20.	55 11	11 31	1443	37·0
21.	55 40	12 46	1476	36·9
22.	56 8	13 34	1263	37·3
23.	56 7	14 19	630	43·5
23*a*.	56 13	14 18	420	46·4
24.	56 26	14 28	109	46·4
25.	56 41	13 39	164	46·5
27.	Rockall Bank.		54	48·3
28.	56 44	12 52	1215	37·1
30.	56 24	11 49	1380	37·1
31.	56 15	11 25	1360	37·2
	Lough Swilly.		3–13	
	Lough Foyle.		10	
	North Channel.		40	

Dredgings were made at nearly all the sounding-stations in this cruise.

Second Cruise.

Off the South of Ireland.

No. of Station.	North Latitude.	West Longitude.	Depth in Fathoms	Bottom Temperature.
	° ′	° ′		°
33.	50 38	9 27	74	49·6
34.	49 51	10 12	75	49·6
35.	49 7	10 57	96	51·3
36.	48 50	11 9	725	43·9
37.	47 38	12 8	2435	36·5
38.	47 39	11 33	2090	36·3
39.	49 1	11 56	557	47·0
40.	49 1	12 5	517	47·7
41.	49 4	12 22	584	46·5
42.	49 12	12 52	862	39·7
43.	50 1	12 26	1207	37·7
44.	50 20	11 34	865	39·4
45.	51 1	11 21	458	48·1
45 *a*.			180	
45 *b*.			113	

Dredgings were made at all the sounding-stations in this cruise.

Third Cruise.

North of the Hebrides to the Faroe Isles.

	° ′	° ′		°
47.	59 34	7 18	542	43·8
51.	59 54	7 52	355	46·2
52.	60 25	8 10	384	30·6
55.	60 4	6 19	605	29·8
56.	60 2	6 11	480	30·7
57.	60 14	6 17	632	30·5
58.	60 21	6 51	540	30·8
60.	61 3	5 58	167	44·3
61.	62 1	5 19	114	45·0
62.	61 59	4 38	125	44·6
64.	61 21	3 44	640	30·0
65.	61 10	2 21	345	30·0
		East Longitude.		
68.	60 23	0 33	75	44·0
69.	60 1	0 18	67	43·8
70.	60 4	0 21	66	45·1
89.	59 38	7 46	445	45·5
90.	59 41	7 34	458	45·2
	The Minch.		60–80	
	Little Minch.		45–50	
	Near Belfast.		70	
	Loch Torridon.		40	
	Off Lerwick.		10–66	

Not many deep-sea dredgings were made during the third cruise, although soundings were taken at all the stations.



'Porcupine' Expedition, 1870.

First Cruise.

Falmouth to Gibraltar.

No. of Station.	North Latitude.	West Longitude.	Depth in Fathoms.	Bottom Temperature.
	° ′	° ′		°
1.	48 38	10 15	567	
2.	48 37	10 9	305	48·5
3.	48 31	10 3	690	
3 *a*.			500	
6.	48 26	9 44	358	50·3
8.	48 13	9 11	257	50·0
9.	48 6	9 18	539	48·0
10.	42 44	9 23	81	53·1
11.	42 32	9 24	332	51·5
12.	42 20	9 17	128–232	52·5
	Vigo Bay.		20	
	Off Cape Mondego.		100-380	
13.	40 16	9 37	220	52·0
14.	40 6	9 44	469	51·5
16.	39 55	9 56	994	40·3
17.	39 42	9 43	740–1095	39·7
17 *a*.	39 39	9 39	795	49·3
17 *b*.			785	
19.	39 27	9 39	248	51·7
	Setubal Bay.		64	
	Off Cape Espichel.		740	
22.	38 15	9 33	718	52·0
24.	37 19	9 13	292	52·7
25.	37 11	9 7	374	53·5
	Off Cape Sagres.		45–58	
26.	36 44	8 8	364	52·7
27.	36 37	7 33	322	51·3
28.	36 29	7 16	304	53·3
28 *a*.			286	
29.	36 20	6 47	227	55·0
30.	36 15	6 52	386	52·7
31.	35 56	7 6	477	50·5
32.	35 41	7 8	651	50·0
33.	35 33	6 54	554	49·7
34.	35 44	6 53	414	50·0
36.	35 35	6 26	72–128	55·0
	Tangier Bay.		35	
	Gibraltar Bay.		3	

I dredged at nearly all the stations in this cruise.

Second Cruise.

Mediterranean.

No. of Station.	North Latitude.	West Longitude.	Depth in Fathoms.	Bottom Temperature.
	Algesiras Bay, Gibraltar.		1–15	
	° ′	° ′		°
40.	36 0	4 40	586	55·0
41.	35 57	4 12	730	55·0
45.	35 36	2 29	207	54·7
	Capo de Gata.		40–69	
	Cartagena Bay.		60–84	
50.	Algerine Coast.		5–51	
50 *a*.			152	
	Off Jijeli.		40–80	
		E. Long.		
51.	36 55	1 10	1415	54·7
54.	37 41	6 27	1508	55·0
55.	37 30	6 51	1456	55·0
	Gulf of Bona.		25	
	Benzert Road.		40–65	
	Rasel Amoush.		45	
	Gulf of Tunis.		25–85	
	Adventure Bank.		30–92	
	Off Rinaldo's Chair.		60–160	
58.	36 43	13 36	266	56·5

Very few productive deep-sea dredgings were made during this second cruise.

Some of the new and peculiar species of Mollusca, which were procured in these expeditions, have been already described and noticed by me in the fifth volume of 'British Conchology,' the 'Proceedings of the Royal Society,' and the 'Annals and Magazine of Natural History.' I will now endeavour to complete the work, and to record all the species, with particulars of their geographical, bathymetrical, and geological distribution. Figures of the more remarkable species will also be given.

I commence with the class usually regarded as lowest in the scale of organization, or the least-specialized, among the Mollusca, viz. the

BRACHIOPODA.

Notwithstanding the long and persevering labours of that monarch of Brachiopodists, Mr. Davidson, as well as of Professor King, Mr. Dall, and other excellent zoologists, the natural arrangement and coordination of this difficult class cannot be said to be yet satisfactorily established. I prefer to steer a middle course between extreme systematists, and not to follow Professor King in making *Terebratula cranium* the type of another genus (his *Macandrevia*), nor to compress all the family of *Terebratulidæ* into the single genus *Terebra-*

tula, as Mr. G. B. Sowerby, Junr., and Mr. Reeve have done. As to *Terebratulina* and *Waldheimia*, Mr. Davidson some years ago considered both subgenera of *Terebratula*; but he is now of opinion that *Waldheimia* is a distinct genus, because (to use his own words) "the recent or living species are but a handful, in comparison with the fossil species, and these last must be taken into account when making divisions of the class, and it would be a very great advantage to retain such divisional groups, which have so many distinguishing characters, and are so numerous." I fully admit the force of his reasoning on the first mentioned ground, and that all fossil species must be included with recent species in the same scheme of classification; but the latter ground, which depends on the validity of distinctive characters and the relative number of species, is not, in my opinion, equally tenable. It is notorious that *Terebratulina* and *Waldheimia* gradually pass one into another, as well as into the main or typical genus *Terebratula*; and I contend, with great deference to Mr. Davidson's more experienced judgment, that it would be more advantageous to science not to multiply unnecessarily the generic names, when fewer would answer every purpose. It cannot be pretended that such names have any value beyond being mere symbols or signs to distinguish and recognize certain groups; they are, and must be, quite artificial and arbitrary. The question of number of species in a genus does not appear to me of much importance. Take for instance the genera *Unio*, *Helix*, and *Bulimus*, each of which, even in a restricted sense, contains several hundred species. It may, of course, be possible to divide these and other well-stocked genera into more genera, each containing an equal number of species; and the same method might be adopted with respect to the species, and even with respect to the individuals of every species. But that would hardly be a scientific proceeding; and it might cause much confusion or needless trouble. All genera ought to be equivalent as regards distinctive characters, not as regards the number of species.

I will now venture to suggest an arrangement of the few Brachiopoda which are at present known to inhabit the European seas, and which comprise the species procured in the 'Lightning' and 'Porcupine' Expeditions. The following Table gives not only the names of the species and principal varieties, but also the range of depth and the places where they have been found fossil in the Tertiary formation.

BRACHIOPODA OF THE EUROPEAN SEAS.

No. of Species.	'Lightning' or 'Porcupine.'	Names of species and varieties.	Range of depth in fathoms.	Localities where fossil.
		*Jointed.		
		A. Perforated or tubuliferous.		
		Family I. TEREBRATULIDÆ.		
		Genus I. TEREBRATULA.		
		Subgenus I. *Terebratulina.*		
1.	—	caput serpentis, *Linné*	0–1180	Coralline Crag; Scotland; Scandinavia; Belgium; South Italy; Azores.
2.	—	tuberata, *Jeffreys*	340–795	
3.		trigona, *Jeffr.*	500	
		Typical.		
4.		subquadrata, *Jeffr.*	500–600	
5.	—	vitrea, *Born*	5–1456	S. Italy.
		var. minor, *Philippi*	40–1000	S. Italy; Morea.
		var. sphenoïdea, *Ph.*	100–994	S. Italy.
		Subgenus 2. *Waldheimia.*		
6.		tenera, *Jeffr.*	1450	
7.	—	cranium, *Müller*	5–690	Scandinavia; S. Italy.
8.	—	septata, *Ph.*	64–725	Norway; S. Italy; Rhodes.
		Genus II. TEREBRATELLA.		
9.		spitzbergensis, *Davidson*	20–690	Scandinavia; Canada.
		Genus III. ARGIOPE.		
		Typical.		
10.	—	decollata, *Chemnitz*	18–364	S. W. France; Austria; Italy; Malta; Rhodes.
		Subgenus 1. *Cistella.*		
11.		neapolitana, *Scacchi*	30–130	S. W. France; S. Italy; Rhodes; Austria.
12.		cistellula, *S. V. Wood*	20–45	Coralline Crag; Austria; Sicily; Rhodes.
13.		cuneata, *Risso*	28–200	Austria; S. Italy; Rhodes.
		Subgenus 2. *Gwynia.*		
14.		capsula, *Jeffr.*	8–25	Norway.
		Genus IV. PLATYDIA.		
15.	—	anomioïdes, *Sc. & Ph.*	40–600	Sicily; Austria.
		Genus V. MEGERLIA.		
16.	—	truncata, *L.*	20–292	Italy; Austria.
		var. monstruosa, *Sc.*	20–292	Sicily.

BRACHIOPODA OF THE EUROPEAN SEAS (*continued*).

No. of Species.	'Lightning' or 'Porcupine.'	Names of species and varieties.	Range of depth in fathoms.	Localities where fossil.
		Genus VI. THECIDEA.		
17.		mediterranea, *Risso*	30-300	Turin; Sicily.
		B. Imperforate.		
		Family II. RHYNCHONELLIDÆ.		
		Genus I. ATRETIA.		
18.	—	gnomon, *Jeffr.*	650–1443	
		Genus II. RHYNCHONELLA.		
19.		psittacea (rostrum-psittaci), *Ch.*	10-690	G. Britain and Ireland; Scandinavia; Canada.
20.	—	sicula, *Seguenza*	690	Sicily.
		**Hingeless.		
		Family I. CRANIIDÆ.		
		Genus CRANIA.		
21.	—	anomala, *Müll.*	3-808	Sicily.
		Family II. DISCINIDÆ.		
		Genus DISCINA.		
22.	—	atlantica, *King*	690–2400	Coralline Crag.

Two new and remarkable species of *Terebratula* (viz. *T. trigona* and *T. subquadrata*) were dredged by Mr. Saville Kent in 1871 off the coast of Portugal; and these species I propose to describe and figure, because my dredgings in the 'Porcupine' Expedition of 1870 were nearly on the same ground. Mr. Kent's discovery confirms my previous statement and unchanged impression, that we know very little of the deep-water fauna, and that it is an inexhaustible field of research. *Terebratula tenera*, from the 'Valorous' Expedition, is also figured.

I will notice very briefly the other Brachiopods of the European seas, which were not procured in the 'Lightning' or 'Porcupine' Expedition.

For the illustrations accompanying this paper, and for other valuable assistance, I am indebted to my friend Mr. Davidson.

* *Jointed.*

A. *Perforated or tubuliferous.*

Family I. TEREBRATULIDÆ.

Genus I. TEREBRATULA.

Subgenus I. *Terebratulina.* Loop, short, annular in its adult state.

1. TEREBRATULA CAPUT-SERPENTIS, Linné. (Plate XXII. fig. 1.)

Anomia caputserpentis, L. S. N. ed. 12, p. 1153: *T. caput-serpentis*, 'British Conchology,' ii. p. 14, pl. i. f. 1; v. p. 164, pl. xix., f. 2.

'Lightning' Expedition: Station 4, 530 fathoms.

'Porcupine' Exp., 1869: St. 2, 808 f., on *Oculina prolifera*; 6, 90 f.; 14, 173 f.; 16, 1180 f.; 23*a*, 420 f.; 25, 164 f.; 54, 363 f.; 57, 632 f.; 61, 114 f.; 65, 345 f.; 74 and 75, 203–250 f.; 77, 560 f.; 78, 290 f.; 84, 155 f.; Loch Torridon, 40 f.; off Belfast, 70 f. 1870: Atlantic, 24, 292 f.; Mediterranean; Adventure Bank, 92 f.; off Rinaldo's Chair, 60–160 f.

Spitzbergen and Davis Strait to Malta and the Adriatic; Jamaica; North-East America; Japan; Korea; Australia; New Zealand: shore to 150 f.

Extremely variable with respect to the proportional length of the shell and the number of ribs or striæ. One variety is the *T. septentrionalis* of Couthouy; and another may be called *mediterranea*, which is longer and more slender, more compressed or flatter than usual, and more or less cloven in front. In a monstrosity from the Adventure Bank the upper valve is extraordinarily convex and boat-shaped, and there are no longitudinal ribs or striæ on the outer margin.

I have figured (Pl. XXII. f. 1) the interior of a young specimen to show that the loop is not in that stage of growth completely annular or closed at the top, which is the principal characteristic of the subgenus *Terebratulina*.

The synonyms are very numerous; I have noted seventeen.

The localities for this and other Brachiopods in a fossil state will be found in the table of species.

2. TEREBRATULA TUBERATA[1], Jeffr. (Plate XXII. fig. 2.)

SHELL, upper valve ovately triangular, somewhat convex; lower valve squarish, compressed; it is solid, opaque, and lustreless: *sculpture*, about 20 fine longitudinal ribs, besides a few intermediate striæ, all of which radiate from the beak, and are closely covered with short tubercles, some of which at the sides are raised and become prickly: *cæcal tubuli* very minute and numerous: *colour* brownish white: *margins* of upper valve in front rounded and slightly scalloped by the ribs, at the sides sloping with a gentle curve, behind acute-angled: *beak* pointed: *foramen* or byssal passage oval, incomplete: *deltidium* broad, slightly excavated or concave: *hinge-plate* thick: *teeth* in upper valve small, strong, and

[1] Covered with prickles.

triangular: *skeleton* or apophysary process in lower valve consisting of a simple loop, which is attached to the hinge by short and stout crura, ending in proportionally large triangular upright points or spurs, from which proceeds the obtusely angular or nearly semicircular portion of the loop at the base; the outer surface of the crura is minutely and closely ridged across: *inside* furnished with about 10 ribs, but not with any intermediate striæ; edge notched to correspond with the furrows. L. 0·1, B. 0·085.

'Porcupine' Exp., 1870: St. 17*a*, 795 f. A single (upper) valve only.

I have also, through the kindness of Professor Lovén, a perfect specimen from the Josephine Bank off the Strait of Gibraltar, which was dredged in 340–430 fathoms.

The peculiar shape and sculpture serve to distinguish this tiny species from the young of *T. caput-serpentis*, and from the next species *T. trigona*.

3. TEREBRATULA TRIGONA[1], Jeffreys. (Plate XXII. fig 3.)

SHELL triangular, much compressed, solid for its size, semitransparent between the ribs, and glossy: *sculpture*, 8 rounded longitudinal ribs, which radiate from the beak, and become gradually broader towards the front; those in the middle of each valve are the largest; the ribs are strongly wrinkled across by the lines of growth; the interstices or furrows are narrow: *cæcal tubuli* numerous and close-set: *colour* clear white: *margins* gently curved and scalloped in front, abruptly sloping at the sides, broad or having somewhat ear-like expansions behind: *beak* short: *foramen* oval and proportionally large, incomplete: *deltidium* small: *hinge-plate* thick: *teeth* in the upper valve short and strong: *skeleton* in the lower valve consisting of a semicircular loop, which is attached on each side by short and strong crura, and terminate in small pointed spurs: *inside* of both valves smooth and polished, exhibiting through the shell the thick outside ribs. L. 0·1, B. 0·1.

A single living specimen was dredged by Mr. Kent, in Mr. Marshall Hall's yacht the 'Norna,' off the coast of Portugal, in about 500 fathoms. He very obligingly gave it to me with a specimen of the following species. It may perhaps be immature; but I cannot identify it with the young of any other species.

This pretty little shell differs from the young of *T. caput-serpentis* in shape, colour, having fewer ribs and a smooth interior, and in the loop being rounded instead of incurved at the base. In *T. caput-serpentis* of the same size as this (Pl. XXII. fig. 1) the inside, especially in front, has strong and conspicuous ridges, which become notches in the full-grown shell.

Typical. Loop short, semiannular.

4. TEREBRATULA SUBQUADRATA[2], Jeffreys. (Plate XXII. fig. 4.)

SHELL broadly triangular or oval, with a squarish outline; upper

[1] Triangular. [2] Somewhat square.

valve gibbous; lower valve somewhat compressed; it is rather solid, opaque, and lustreless: *sculpture*, slight and fine longitudinal striæ, which radiate from the beak (50 to 60 in a larger, and half that number in a smaller specimen); these are crowded at the sides, and are occasionally or partially intervenient; concentric marks of growth distinct, besides numerous intermediate and irregular lines: *cæcal tubuli* white, minute, and close-set: *colour* white, with an ochreous tinge: *margins* curved in front, or slightly indented there in the middle of the upper valve, more or less truncated at the sides, rounded and somewhat shouldered behind in the lower valve: *beak* extended or produced: *foramen* large, circular, complete, thickened, and reflected at the lower side: *deltidium* long and narrow, slightly grooved across: *hinge-plate* thick and broad: *teeth* in the upper valve short and incurved: *loop* narrow, keyhole-shaped, attached to the hinge by short crura, which terminate halfway in small blunt spurs, obtusely angular below in the smaller, and flexuous in the larger specimen: *inside* smooth, slightly grooved lengthwise in the smaller specimen, to correspond with the outside striæ, and having the inner edges of the larger specimen thickened and notched or crenate, as in *Astarte sulcata* and in many species of *Venus*, *Nucula*, and other genera. L. 1·05, B. 1 (larger specimen); L. 0·65, B. 0·55 (smaller specimen).

Hab. Off the coast of Portugal, in 500–600 fathoms (*Kent*).

Of this new and interesting species Mr. Kent dredged two specimens and a couple of valves, which he presented to Mr. Davidson and myself.

I at first thought it might be the *T. orbiculata* of Seguenza (Mem. Soc. Ital. Sc. Nat. t. i. no. 4, 1865, p. 7, tav. ii. f. 14–16), judging from the description and figures; but he has lately, with his usual courtesy, sent me for inspection the type of his species. This shows that the smaller valve is not shouldered (so as to give the shell a squarish outline), and that the striæ are much finer and more numerous than in *T. subquadrata*. He, indeed, now suspects that his species may be the young of a large species, such as *T. ampulla* or *T. grandis*; but that species is not striated lengthwise. I should be inclined to refer Seguenza's species to the variety *sphenoïdea* of *T. vitrea*. The form of the skeleton or apophysis depends to some extent on the shape of the specimen in a species so variable as *T. vitrea*.

5. TEREBRATULA VITREA, Born. (Plate XXII. fig. 5.)

Anomia vitrea, Born, Test. Mus. Cæs. Vind. p. 104.

'Porcupine' Exp., 1870: Atlantic, St. 13, 220 f.; 16, 994 f.; 17*a*, 740 f.; 24, 292 f.; 25, 374 f.; off Cape Sagres, 45–58 f.; 26, 364 f.; 27, 322 f.; 28, 304 f.; 29, 227 f.; Mediterranean, 45, 207 f.; Capo de Gata, 40–69 f.; 55, 1456 f.; Adventure Bank, 92 f.

Atlantic coast of Spain to the Adriatic and Ægean: depths 5–310 f.

BODY clear white and gelatinous: *mantle* lining the valves, and

furnished at its edges with short and very delicate close-set cilia of different lengths and sizes, which project somewhat beyond the valves, as in *T. caput-serpentis*.

The tubercles which close the tubular perforations in the shell are extremely small and numerous. In some large and unusually thick valves dredged by Dr. Carpenter in H.M.S. 'Shearwater,' off the coast of Tunis, the perforations are irregular or unsymmetrical, as in *T. grandis*.

Var. 1. *minor*, Philippi, = *T. affinis*, Calcara.

'Porcupine' Exp., 1870: Mediterranean, St. 58, 266 f.

Off Jan Mayen's Isle, 263 f. (Friele, as *T. arctica*); Mediterranean, Adriatic, and Ægean, 30–310 f.; 'Challenger' Exp., off Cape of Good Hope, 150 f., and Azores, 1000 f.; 'Josephine' Exp., off Villa Franca, Azores, 320–600 f.; Japan, 55 f. (A. Adams, as *T. davidsoni*).

In a specimen of this variety from the Bay of Naples the front margin is cloven or deeply indented, apparently in consequence of the mantle having been injured in that part.

Var. 2. *sphenoïdea*, Philippi. (Plate XXII. fig. 6.)

'Porcupine' Exp., 1870: Atlantic, St. 16, 994 f., 24, 292 f.; 25, 374 f.

Gulf of Florida, 100–270 f. (Pourtales, as *T. cubensis*).

After a protracted and very careful examination of my specimens, which I had considered the *T. sphenoïdea* of Philippi, and having compared them with fossil specimens sent me by Professor Seguenza as Philippi's species from the Sicilian Tertiaries, as well as with a series of *T. cubensis* which I received from Count Pourtales and Professor Alexander Agassiz, and also after a close comparison of all these specimens with the description and figures given by Philippi, Seguenza, Pourtales, and Dall, I am convinced that *T. sphenoïdea* and *T. cubensis* are the same, and constitute a well-marked variety of *T. vitrea*. The loop in *T. sphenoïdea* and *T. cubensis* is precisely similar. The shape and proportions of the loop depend on the shape of the shell in *T. vitrea*, and, I believe, in every other species of *Terebratula*. Some recent and fossil specimens of this variety exhibit more or less distinct, although slight, longitudinal striæ, which radiate from the beak and are especially visible at the sides; and the same kind of sculpture is occasionally observable in specimens of the typical form of *T. vitrea*.

As to synonyms, I cannot recognize any valid character that would serve to distinguish Seguenza's Sicilian Tertiary species, *T. elliptica* and *T. michelottiana* from *T. vitrea*, or his *T. miocenica*, *T. orbiculata*, and *T. benoitiana* from the variety *sphenoïdea*. *T. manticula* of Fischer (Journ. Conch. t. xvii. p. 81, pl. iii. fig. 4), a Miocene fossil of the south-west of France, seems to be closely allied to the variety *minor*, the only difference being that the deltidium in the fossil is larger. *T. cernica* of Crosse, from the Mauritius (Journ. Conch. t. xxi. p. 285, and xxii. p. 75, pl. i. fig. 3), may be also the present nearly ubiquitous species.

Costa, in his 'Fauna del Regno di Napoli,' refers the *T.*

sphenoïdea of Philippi to the variety *trigona* of his own *T. irregularis*, which is represented as having the skeleton of *T. septata* or some other septigerous species of the subgenus *Waldheimia*.

Subgenus II. *Waldheimia*. Loop long, reflected.

6. TEREBRATULA TENERA, Jeffreys. (Plate XXII. fig. 7.)

T. tenera, Jeffr. in Ann. & Mag. N. H., Sept. 1876, p. 250.
'Valorous' Exp.' 1450 f.

7. TEREBRATULA CRANIUM, Müller.

T. cranium, Müll. Zool. Dan. Prodr. p. 249, no. 3006: Br. Conch. ii. p. 11; v. p. 163, pl. xix. fig. 1, 1*a*.

'Lightning' Exp.: St. 2, 170 f.; 4, 530 f.; 5, 189 f.; 7, 650 f.; off the Faroes, 164 and 208 f.

'Porcupine' Exp., 1869: St. 14, 173 f.; 15, 422 f.; 23*a*, 420 f.; 25, 164 f.; 46, 374 f.; 50, 355 f.; 57, 632 f.; 61, 114 f.; 65, 345 f.; 74, 203 f.; 75, 250 f.; 78, 290 f.; 83, 262 f.; 84, 155 f.; 85, 190 f. 1870: St. 1, 567 f.; 2, 305 f.; 3, 690 f. (and var. *oblonga*); Vigo Bay, 30 f.; 24, 292 f.

Greenland (Wallich, Möbius), and Norway (Müller and others), to the south-west of France (De Folin, Fischer), Vigo (McAndrew): 5–650 f. St. Margaret's Bay, Nova Scotia (Willis)? Northern Asia and Japan (A. Adams).

The tubercles or cæcal extremities of the canals which permeate the shell are more numerous in this than in the next species (*T. septata*), and are arranged in wavy lines. The gradual development of the skeleton or apophysary process in both species is very remarkable, and has been admirably shown by Herr Friele of Bergen in a series of figures which accompany his papers on the subject in the 'Vidensk. Selsk. Forh.' for 1875, pl. i. fig. 9, *a–i*, and 'Archiv for Mathematik og Naturvidenskab' for 1877, tab. i.–iii. Mr. Charles Moore had also, in 'the Geologist' for 1860, described and illustrated certain modifications in the loop of a fossil species, *Terebratella buckmanni*, which are not less important in respect of the classification of the Brachiopoda. The skeleton of a young *Megerlia truncata*, and probably of every other jointed Brachiopod, is different from that of an adult specimen.

In the second volume of my work on British Conchology, p. 14, I stated that the lower valve in the young of *T. cranium* is "furnished with a very distinct and prominent crest or ridge, placed inside and nearly in the middle of this valve," and that the same character "likewise occurs in *T. septata*, Philippi, a Sicilian fossil (*T. septigera*, Lovén), and is remarkably developed in that species; but the foramen is incomplete in *T. cranium*, and entire in *T. septata*." I now find, on further examination of my Shetland specimens, that some of those which I had taken to be the young of *T. cranium* really belong to *T. septata*; and consequently the latter species is an inhabitant of our own coasts as well as of the Norwegian

and other seas. The septum in the very young of *T. cranium* consists of a mere upright point, as in *Megerlia*; and the loop is then round and small, becoming elliptical and extended in the adult. The foramen is incomplete in the young of *T. septata*, and resembles that of *T. cranium* in every state; and this is likewise the case as to the young of *T. vitrea*.

Mr. Dall, in the 'American Naturalist' for March 1871 (vol. v. p. 55), indicated a new genus of Brachiopods, founded on some young specimens of *T. cranium* which I had sent him from the 'Porcupine' dredgings in 1869. He said the loop "has no secondary attachment to the hæmal valve, and the latter is destitute of a septum." This genus he proposed to name *Frenula*, and the species *jeffreysii*. In the American Journal of Conchology for 1871 (vol. vii. pt. 2, p. 65, pl. ii. figs. 7–10) he gave a more detailed account, with figures, of the same species as *Ismenia*? *jeffreysi*. His figures agree with those published by Herr Friele to illustrate the development of the skeleton in *T. cranium*. Mr. Dall remarks as to his species, "Without a septum in either valve. Loop unattached except by the hæmal processes to the hinge plate," and further on, "None of the specimens had the slightest trace of a septum." He then alludes to having subsequently received from me other young Brachiopods, of which he says, "All of them possessed a filiform but rather stout septum;" and, although with some doubt, he was of opinion that all the specimens belonged to the same species, and that in those first mentioned "the septum must have been broken away." He has since, at my request, kindly sent me for my inspection a specimen of his species, which he now calls *Megerlia jeffreysi*, and which he says he received from me as the young of *T. cranium*; and he has presented me with some valves dredged by him at Port Etches in Alaska, at a depth of about 15 fathoms, and which according to him were "probably" the same species, although he carefully explained that he would not vouch for it. The valves in question were worn and apparently old, but all of them showed the septum most distinctly; and they may belong to the species which Mr. Dall has very lately described anew as *Megerlia jeffreysi*. These valves are not unlike *Terebratella* (?) *frontalis* of Middendorff in shape and texture; but they differ essentially in the position of the septum as well as in the deltidium. In Mr. Dall's imperfect specimens the septum resembles that of *Terebratella spitzbergensis*, viz. in being a long narrow and thread-like lamina extending from the middle of the deltidium for about two thirds of the inside towards the front; in *T. frontalis* (judging from the type most obligingly sent me by Dr. v. Schrenck from the St. Petersburg Museum for my inspection) the septum is that of *Argiope*, being gnomon-shaped or triangular, and placed near the front. The apophysis of *Megerlia truncata* does not correspond with that of any of the above-named species. I would here remark that the septum is not at all likely to be broken away and entirely disappear, because it is formed in the protected part of the lower valve. It is persistent in the most worn and even fragmentary spe-

cimens of *T. septata*, *Terebratella spitzbergensis*, and *T.* (?) *frontalis*, and of other similarly furnished Brachiopods. Mr. Dall has now redescribed *Megerlia jeffreysi* in his 'Scientific Results of the Exploration of Alaska' (June 1877, p. 48), and says as to the apophysis "*Megerliæ sanguineæ* simillima," the habitat being thus given, "N. E. Atlantic, 155–345 fathoms, Jeffreys, with *Waldheimia cranium*. Semidi Islands, Port Etches, Dall; Victoria, V. Id, J. Richardson." Mr. Davidson tells me that Herr Friele was mistaken in saying that the former considered *M. jeffreysi* the young of *Meyerlia sanguinea*.

Now I fear there must have been some mistake about the Atlantic and Pacific specimens. I have no doubt that the shell described last year by Mr. Dall as *Megerlia jeffreysi* (see Plate XXIII. fig. 3), and which by his permission I have examined, is a perfectly good species of *Megerlia*, having a distinct septum and the loop three times attached; and I thank him sincerely for the compliment he has paid me in associating my name with it. But at the same time I firmly believe that the specimens described by him in 1871 as *Frenula jeffreysii* and *Ismenia? jeffreysi* belong to a different species and another genus, and that such last-mentioned species was *T. cranium*. The other specimens which I afterwards sent him, and which had a "rather stout septum," may have been the young of *T. septata*.

Synonyms: *Anomia terebratula*, L.; *Terebratula plicata*, Philippson; *T. euthyra*, Philippi; *T. subvitrea* and *T. glabra*, Leach; and perhaps, in the younger state, *Waldheimia davidsoniana* of Seguenza.

Mr. Davidson in 1853 and 1855 placed *Waldheimia* as a subgenus of *Terebratula*; but in 1861 he raised it to generic rank.

8. TEREBRATULA SEPTATA, Philippi. (Plate XXIII. figs. 1, 1 *a*, *b*, *c*; loop.)

T. septata, Ph. Moll. Sic. ii. p. 68, t. xviii. fig. 7 (1844).

'Porcupine' Exp., 1869: St. 23*a*, 420 f.; 36, 725 f.; 39, 557 f.; 54, 363 f.: 65, 345 f.; 67, 64 f.; 68, 75 f.; 74, 203 f.; 75, 250 f. 1870: 1, 567 f.; 3, 690 f.; 6, 358 f.; 9, 539 f. A perfect cast or petrifaction of apparently this species was also dredged by me, with other Tertiary fossils, at Station 24, 292 f., off the Atlantic coast of Spain.

Norway, 100–300 f. (Lovén and others); Shetland, 80–90 f., young, with *T. cranium* (J. G. J.).

A Japanese Brachiopod, *Terebratella mariæ* of A. Adams, may be a dwarf variety of the present species, corresponding with the variety *minor* of *T. vitrea*. *Waldheimia raphaëlis* of Dall, also from the North Pacific, looks like a gigantic variety of *T. septata*, the author having kindly permitted myself and Mr. Davidson to compare his specimen of *W. raphaëlis* with some of *T. septata*, my largest specimen of which measures an inch and three tenths in length.

I cannot detect any distinctive character of importance in *Waldheimia floridana* of Pourtales, from the Gulf of Florida, 100–200 fathoms, to separate it specifically from *T. septata*. He says (Bull.

Mus. Comp. Zool. No. 7, 1869, p. 127), "Very young specimens are flatter, rounded, and have a strait margin; they could scarcely be distinguished from the young of *Terebratula cubensis*, if it was not for the loop and septum seen by transparency. There is also some variety of form in the old; in some specimens the length is greater than the breadth, and there is considerable diversity in the sinuosity of the frontal margin." *T. septata* is not less variable in shape and in the flexuosity of the front margin; a young specimen which I dredged in the 'Porcupine' Expedition of 1870, attached to a branch of *Oculina prolifera*, was mistaken by me for *Terebratella spitzbergensis*, having the same oval and laterally compressed outline, and a similar septum visible through the shell.

In young and half-grown specimens of *T. septata*, as well as in other allied species, the side flanges or flaps of the loop are closed by a membrane, which is removable; the openings then appear. The inner layer of the shell is microscopically and closely striated lengthwise. The gradual development of the skeleton or apophysary process, indicated by the changes which take place in the course of growth, is very remarkable, and is shown in the accompanying figures (Plate XXIII. figs. 1 *a*, *b*, *c*). Mr. Davidson and I agree that the loop in *T. septata*, when quite young, resembles that of a *Megerlia*, and is three times attached; at a rather more advanced age it assumes the form of a *Terebratella*, and is twice attached; in the full-grown state it has all the characteristics of the subgenus *Waldheimia*, and is attached only to the hinge-plate. Mr. Friele has also, to some extent, demonstrated these retrograde changes in his papers above referred to.

This species is unquestionably the *T. septigera* of Lovén (1846), and equally without doubt (so far as my opinion is worth any thing in either case) the *T. septata* of Philippi, 1844. Seguenza, however, considers Philippi's species to belong to the genus *Terebratella*; and he has named Lovén's species *Waldheimia peloritana*. Although the skeleton represented in Philippi's figure was imperfect, there is no appearance of the cross bar to which the loop is attached in *Terebratella*, and which cross bar is not less persistent than the septum in broken and worn specimens of so many species of that genus as well as of *Megerlia*. Indeed his description and figures agree as closely with imperfect specimens of *T. septigera*, as those of his *T. euthyra* with imperfect specimens of *T. cranium*. Seguenza may have found in the Sicilian Tertiaries not only his *W. peloritana*, which he now refers to *T. septigera*, but also a species of *Terebratella* which he regards as Philippi's species. For this last-mentioned species, if not known in a recent or living state, he might give another name. Were not priority of publication an essential standpoint for scientific nomenclature, *septigera* might be retained for the recent species, and *septata* for Seguenza's fossil species of *Terebratella*; but in the absence of better data it may be more advisable "quieta non moveri." *W. peloritana* and *W. floridana* appear to be the same variety of *T. septata*.

I cannot refrain from expressing my admiration of the careful and

valuable work of Professor Seguenza, notwithstanding that my notions of the distinctive character of certain species do not accord with his.

Genus II. Terebratella.

Terebratella spitzbergensis, Davidson. (Plate XXIII. fig. 2; loop.)

Terebratella spitzbergensis, Dav. in Ann. & Mag. N.H. 1855, xvi. p. 442, pl. x. fig. 3: B. C. ii. p. 2; v. p. 164, pl. xcix. fig. 3.

Spitzbergen, Iceland; 'Valorous' Expedition, Wellington Channel, Davis Strait, Gulf of St. Lawrence, North Japan, and Shetland: depths 20-690 fathoms.

Genus III. Argiope.

Typical. Having three septa.

1. **Argiope decollata**, Chemnitz.

Anomia decollata, Ch. Conch. Cab. viii. p. 96, pl. 78. figs. 705 *a–d*.

Argiope decollata, B. C. ii. p. 18; v. p. 164, pl. xix. fig. 3.

'Porcupine' Exp., 1870: Atlantic, St. 24, 292 f.; 36, 364 f. Mediterranean, 58, 50 f.; Adventure Bank, 92 f.

Guernsey, South-west of France, Atlantic coasts of Spain, Mediterranean, Adriatic, Ægean, Madeira, Canary Isles: 18-130 f.

In some specimens, recent and fossil, the ribs are evanescent or scarcely perceptible. Size variable.

Synonyms: *Anomia detruncata*, Gmelin; *Terebratula aperta*, De Blainville; *T. cardita* and *T. urna-antiqua*, Risso; *T. ungula*, Retz; *T. pectiniformis*, O. G. Costa; *T. dimidiata*, Scacchi.

Subgenus *Cistella*. With a single septum.

2. **Argiope neapolitana**, Scacchi.

Terebratula neapolitana, Sc. Oss. Zool. 1833, ii. p. 18.

Mediterranean, Adriatic, Ægean, and Canary Isles: 30–320 f.

The number of ribs varies from two to eight, some specimens being quite ribless; and the shape and size are also very variable characters, as in *A. cuneata*. From that species *A. neapolitana* may be distinguished by the inner margin in the latter being furnished with a numerous row of small and short ridges, which become tubercular in front, by the anterior margin being indented in the middle, and by the septum in the lower valve being notched across. In some specimens, which are more transparent than usual, the marginal ridges can be seen outside.

Philippi has, in the figures given in his first volume, evidently confounded the present species (his *Terebratula seminulum*) with *Platydia anomioïdes*, which it seems he did not then know.

Terebratula cordata, Risso; *T. seminulum*, Ph.; *Orthis bifida*, Costa; *A. forbesi*, Davidson.

3. ARGIOPE CISTELLULA, S. V. Wood.

Terebratula cistellula, S. V. Wood, in Ann. & Mag. N. H. vi. p. 253.

A. cistellula, B. C. ii. p. 19, pl. 1. f. 2; v. p. 164, pl. xix. f. 4.

Norway, Shetland to Guernsey, Ireland, Normandy, S.W. France: 20–45 f.

I was wrong in referring this species to the *Orthis lunifera* of Philippi, which is (at any rate partly) the young of *Megerlia truncata*. I likewise mistrust the Mediterranean habitat cited by me for a specimen of the present species, and have now omitted it; the specimen was more probably the young of *A. cuneata*.

4. ARGIOPE CUNEATA, Risso.

Terebratula cuneata, Risso, Hist. Nat. de l'Eur. mérid. iv. p. 388, fig. 179.

Mediterranean, Adriatic, Ægean, and Canary Isles: 28–200 f. Probably also Guadeloupe, 111–150 f. (Schramm, fide Crosse and Fischer as *A. schrammi*).

The shape varies from triangular to broadly oblong; ribs two to ten, more or less vanishing in some specimens, and altogether wanting in others.

I have been favoured by Professor Seguenza with an opportunity of examining his unique specimen of *A. biplicata* from the Straits of Messina, and of comparing it with an extensive series of *A. cuneata* and its colourless variety. The result of such examination and comparison, as regards both the outside and inside, compels me to consider the specimen an abnormal form of *A. cuneata*.

Terebratula soldaniana, Risso; *Anomia pera*, v. Mühlfeld; *T. scobinata*, Cantraine, not *Anomia scobinata* of Linné.

Subgenus *Gwynia*. No septum.

5. ARGIOPE CAPSULA, Jeffreys.

Terebratula capsula, Jeffr. in Ann. & Mag. N. H. ser. 3, ii. p. 125, pl. v. f. 4; iii. pl. ii. f. 7, 8.

A. capsula, B. C. ii. p. 21; v. p. 164, pl. xix. f. 5.

East and south of Ireland, Plymouth, Weymouth, Guernsey, Etretat; Sluys-kill, Zealand, near the Belgian frontier (Colbeau)?: 8–25 f.

I have lately opened and carefully examined more specimens of this minute Brachiopod, as well as very young specimens of *Terebratula caput-serpentis*, *T. cranium*, *T. vitrea*, *Argiope decollata*, *A. neapolitana*, *A. cistellula*, *A. cuneata*, *Platydia anomioïdes*, and *Megerlia truncata*, of nearly similar dimensions. All of these last are certainly distinct from *A. capsula* in respect of the internal apparatus or skeleton, which is nearly wanting in *A. capsula*. The young of *Platydia anomioïdes* has, besides the septum, a very large byssal orifice in the lower valve; otherwise that species might be the adult of *A. capsula*: but it has never been found with the latter species,

nor even in the same parts of the ocean. It is clearly unscientific to suppose that, because *A. capsula* is tiny, it cannot be a good species, in whatever genus it ought to be placed. Until there is some proof or fair presumption that it is embryonic or immature, it would be preferable to retain it in the subgenus of *Argiope*, for which Dr. King proposed the generic name *Gwynia*.

Genus IV. Platydia.

PLATYDIA ANOMIOÏDES, Scacchi and Philippi.

Orthis anomioides, Sc. & Ph., Moll. Sic. ii. p. 69, t. xviii. f. 9.

'Porcupine' Exp., 1869.: St. 78, 290 f. One of my specimens is twice the length of any I have seen from the Mediterranean; the other is minute, of an oval shape, and apparently abnormal.

Coast of Portugal, 600 f. (Kent)!; Mediterranean and Ægean, 40–120 f.; Gulf of Florida, 237 f. (Dall); 'Challenger' Exp., "attached to a specimen of *Waldheimia kerguelensis*," St. 145, lat. 46° 40′ S., long. 37° 50′ E., off Prince-Edward Isles, 150 f. (Davidson)!

One of my Tunisian specimens is acutely triangular. The lower valve is sometimes more convex than the upper, as in *Anomia ephippium*, owing to the habit this Brachiopod has of attaching and moulding itself by the under surface to corals and other irregular substances.

This is the *Terebratula appressa* of Forbes, who published it in the same year as Philippi. Mr. Dall referred to this species the *Orthis eusticta* of Philippi; but that is a species of *Megerlia*, and very different from this. According to Professor Seguenza the young of *P. anomioïdes* is the *Terebratula seminulum* of Philippi.

Mr. Davidson proposed the genus *Morrisia* for the present species; but, with true scientific candour, he gave it up in favour of *Platydia*, which had been described by O. G. Costa a few months previously in the same year. In the 'Annals' for December 1855, he apparently considered *Morrisia* and *Megerlia* subgenera of *Terebratella*; and in July 1861 he queried *Morrisia* as a distinct genus. However, his present scheme of classification is much more satisfactory; and I will not presume to criticise it.

Genus V. Megerlia, (*Megerlea*) King.

MEGERLIA TRUNCATA, Linné.

Anomia truncata, L. S. N. p. 1152.

M. truncata, B. C. ii. p. 22; v. p. 164.

'Porcupine' Exp., 1870: Atlantic, St. 24, 292 f. (and var. *monstruosa*); 36, 128 f. Mediterranean, 45, 207 f. (and var.), Capo de Gata, 40–69 f.; 58, 266 f. (and var.); Adventure Bank, 92 f. (and var.).

Atlantic coasts of France and Spain, Mediterranean, Adriatic, and Ægean: 10–120 f. Cape of Good Hope, 224 f. (and var.). Canary Isles, 60 f. 'Challenger' Exp., off Teneriffe, 70–75 f. Isle of Bourbon, 200 f. (Deshayes, as *Morrisia gigantea*). Australia (Angas,

fide Dall). The habitat given by Linné, "in pelago Norvegico," is erroneous, so far as we at present know or believe, as well as "Torquay" on Dr. Turton's authority.

Very common and not less variable. Some specimens, especially the young, are more or less acutely triangular; others are nearly ribless or smooth; the very young have merely a moderately large byssal orifice in the lower valve, the beak of the upper valve being pointed; and the loop is annular as in the subgenus *Terebratulina*. This is a case of progressive development, and the reverse of what takes place in *Terebratula septata*. The skeleton is distorted in the monstrous form or variety. The size given by Deshayes for his *Morrisia gigantea* scarcely exceeds one half of some 'Porcupine' specimens from 266 fathoms.

There are six other synonyms, but obsolete. *Terebratula* (afterwards *Orthis*) *lunifera* of Philippi, Forbes, and Costa is the young; the skeleton being imperfect or broken causes the appearance denoted by that specific name. Mr. G. B. Sowerby, jun., figured in his 'Thesaurus' a ribless variety of *Argiope cuneata* as Philippi's species. The distorted variety, which Scacchi at first described as *Terebratula monstruosa*, but subsequently called "Antecedentis varietas" with reference to the present species, is the *Morrisia davidsoni* of Eudes Deslongchamps; it not unfrequently occurs with the normal and intermediate forms.

Seguenza in 1865 classified "*Megerlea*" as a subgenus of *Terebratella*.

Genus VI. Thecidea.

Thecidea mediterranea, Risso.

T. mediterranea, Risso, Hist. Nat. de l'Eur. mérid. iv. p. 394, f. 185.

Mediterranean, especially the African coasts, 30–300 f. Jamaica, 60 and 150 f. (Barrett, fide Davidson). Mauritius (Sir Henry Barkly)!

Thecidea spondylea of Scacchi, and probably *T. testudinaria* of Michelotti.

B. *Imperforate.*

Family II. Rhynchonellidæ.

Genus 1. Atretia.

Atretia gnomon, Jeffreys. (Plate XXIII. fig. 4.)

A. gnomon, Jeffr. Proc. R. S. no. 121, 18th Nov. 1869, p. 121; Ann. & Mag. N. H. Sept. 1876, p. 251.

'Porcupine' Exp., 1869: St. 20, 1443 f.; 30, 1380 f.

'Valorous' Exp.: Davis Strait, 1100–1750 f.; North Atlantic, 1450 f. Norwegian Arctic Exp., 1877: about thirty miles west of "Tromsö," on the slope of the banks, "cold area," 650 f. (Friele)!

According to Mr. Dall, *Atretia* is a synonym of Zittel's genus *Dimerella* (Dunker and v. Meyer, Palæont. 1870, p. 220), which is a Jurassic Brachiopod; but, although it belongs to the same family,

the internal apparatus is different, and the beak is prominent in *Atretia* and incurved in *Dimerella*. The septum in *Atretia* is short, gnomon-shaped, and central; in *Dimerella* it extends from below the beak to the front of the lower or smaller valve. The genus *Mannia* of Dewalque (Soc. Malac. Belg., 1874), from the "sable noir," or Upper Miocene of the Antwerp Crag, is also a Rhynchonellidan; but the internal apparatus is likewise different from that of *Atretia*.

Each of the curved processes in the lower or smaller valve of *Atretia gnomon* has the outer end trifid, or is divided into three symmetrical digitate points.

Genus II. RHYNCHONELLA.

1. RHYNCHONELLA PSITTACEA (ROSTRUM-PSITTACI), Chemn.

Anomia rostrum-psittaci, Ch., viii. p. 106, tab. 78. f. 4 *a*, *b*, *c*.
R. psittacea, B. C. ii. pp. 22, 23; v. p. 164, pl. xcix. f. 4.

Arctic and northern seas in both hemispheres, from Spitzbergen to Drontheim, and from Franklin-Pierce Bay in 79° 25′ N. lat. to Maine, U.S., in the North Atlantic; and from Behring Strait to Japan in the North Pacific: 10–690 f. Australia, with *R. nigricans* (J. W. Flower)! Shetland, 90–100 f.; apparently recent, but possibly relics of the "glacial era" (J. G. J.). North Sea, S.E. of Yarmouth (Metzger); possibly also semifossil. Several spurious or more than doubtful habitats on the Scotch and English coasts have been recorded.

2. RHYNCHONELLA SICULA[1], Seguenza, MS. (Plate XXIII. figs. 5, 6.)

BODY whitish, gelatinous: *mantle* not furnished at its edge with setæ or bristles, as is the case in the Terebratulidæ: *arms* fringed with short cirri, which are unequal in length and curl inwards at their extremities: *byssal plug* small, cylindrical, and slender; its outer case or sheath is chitinous, and resists the action of liquor potassæ.

SHELL ovately triangular, having the upper valve convex and the lower valve somewhat compressed, rather thin, semitransparent, and glossy: *sculpture*, numerous and close-set, minute, very fine and regular longitudinal striæ; lines of growth slight but distinct: *colour* pale brownish-yellow: *margins* nearly straight in front (instead of being flexuous as in *R. psittacea*), irregularly sloping at the sides, broadly angular behind: *beak* very short, incurved: *foramen* very small, oval, incomplete: *deltidium* broad, slightly concave: *hinge-plate* narrow: *teeth* in the upper valve triangular and long; the processes in the lower valve approximate at the base, forming an inverted V, and are irregularly oblong, rather thin, and concave in the middle; each of these processes extends outwards as a thin and narrow lamina, which curves upwards, and is divided at its outer end in a pectinate or comb-like manner, as in *Atretia gnomon*, but has more digitations or points; the sockets of the teeth are grooved transversely: *septum* ridge-like, short, placed in the centre of the

[1] Sicilian.

large muscular scar below the beak: *inside* smooth and glossy, not contracted behind, nor grooved like *R. psittacea*. L. 0·9, B. 0·75.

'Porcupine' Exp., 1870; St. 3, 690 f.: Chops of the English Channel. One perfect and living specimen, besides two not quite perfect valves and some fragments.

The shape of the Sicilian fossil, for a specimen of which (see Plate XXIII. fig. 6) I am indebted to Professor Seguenza, is rather more broadly triangular, and is uniformly convex; but it agrees with the recent specimen above described in its peculiar sculpture, want of flexuosity in the front margin, short beak, and small foramen. The fibrous texture of the shell is much softer and looser than that of *R. psittacea*[1]. Attached to the living specimen of *R. sicula* is a remarkable species of *Balanus* or an allied genus, which will be elsewhere noticed.

** *Hingeless.*

Family I. CRANIIDÆ.

Genus CRANIA.

CRANIA ANOMALA, Müller.

Patella anomala, Müll. Zool. Dan. Prodr. p. 237.

C. anomala, B. C. ii. p. 24, pl. i. f. 3; v. p. 165, pl. xix. f. 6.

'Lightning' Exp., St. 2, 170 f.; 4, 530 f.; 5, 189 f. (var. *alba*).

'Porcupine' Exp., 1869, St. 2, 808 f.; 6, 90 f.; 7, 159 f.; 12, 670 f.; 14, 173 f., on *Oculina prolifera*; The Minch, 170 f.; 74 & 75, 203–250 f.; 78, 290 f., with *Platydia anomioïdes*. 1870, Atlantic, 1, 567 f.; 3, 690 f., upper valve coloured with reddish-brown streaks; 24, 292 f.: Mediterranean, 45, 207 f.; 58, 266 f.; Adventure Bank, 92 f.

Spitzbergen to the Mediterranean, Adriatic, and Ægean: 3–255 f. Jamaica (Barrett, as *C. personata*, in coll. M'Andrew); North Sea, 0–106 f. (Metzger).

Some of the specimens procured by Dr. Carpenter in H.M.S. 'Shearwater' off the coast of Tunis, in from 40 to 120 fathoms, are unusually thick, especially at their edges, which are closely notched inside; and they belong to the variety which Seguenza has described and figured as *C. lamellosa* from the Sicilian Pliocene beds. In two or three of these 'Shearwater' specimens the hinder margin of the upper valve is nearly straight; and the posterior muscular scars project somewhat beyond the sides, so as to give a hinge-like character to that part of the valve. The interior of the upper valve in one specimen is covered with crowded oblong tubercles, which are arranged in the line of growth. The inside margin of the lower valve is generally more or less raised, as I pointed out in 'British Conchology,' vol. ii. p. 25.

There are several synonyms, viz.:—*Criopus fimbriatus* for the animal or soft parts of this and other Brachiopods, and *Anomia*

[1] In *R. psittacea* the curved processes in the lower valve are rather long, irregularly triangular and twisted; the lamina is furnished underneath with five or six slight obliquely transverse ridges, which form notches at the inside edge.

turbinata for the shell of the present species (Poli); *Patella distorta* (Montagu); *Orbicula norvegica* (Lamarck); *C. ringens* and *C. rostrata* (Hœninghaus); *Discina ostreoides* (Turton); *Criopus orcadensis* (Leach), and *Crania personata* (Sowerby and others, not Lamarck); var. *alba*=*C. suessia* (Reeve, in coll. M'Andrew)!

Mr. Dall was quite right in ascribing the original authorship of the generic name *crania* to Retz, instead of to Philippson, as I had erroneously stated. See Schrift. Berlin. Ges. naturf. Fr. Bd. ii. p. 72, tab. i. f. 2–7, 1781. Philippson published the same name in 1788.

Family II. DISCINIDÆ.

Genus DISCINA.

DISCINA ATLANTICA, King. (Plate XXIII. fig. 7.)

D. atlantica, King in Proc. N. H. Soc. Dublin, 1868, vol. v. p. 170: Jeffr. in Ann. & Mag. N. H., Sept. 1876, p. 202.

'Porcupine' Exp., 1869, St. 19 *a*, 1366 f.

Off the west coast of Ireland, 1240 f. (Capt. Hoskyns). North Atlantic, while fishing up the deep-sea telegraph cable in about 2400 f. (Sir James Anderson), 'Valorous' Exp., 1450 & 690 f. (J. G. J.). 'Challenger' Exp., near St. Paul, 1850 f.; N. Pacific, 1875 f. & 2050 f.; off Bermuda, 2180 f. (Davidson)!

I have also to thank Mr. Davidson for telling me of a mistake in my short description of the animal in the 'Annals' above cited; and I gladly take this opportunity of correcting it. The word *mantle* ought to be substituted for "*arms*."

D. atlantica is probably the same species as the Coralline-Crag fossil which Mr. S. Wood at first doubtfully named *D. norvegica* and afterwards *D. fallens*, and which Mr. Davidson at first doubtfully named *Orbicula lamellosa* and afterwards *D. fallens*. But *O. norvegica* of Sowerby (=*O. lamellosa*, Broderip) is a very different and tropical species of *Discina*.

The genus *Discina* appears to be the connecting link, at least analogically, between the Brachiopoda and Conchifera through *Anomia*, both having a similar plug of attachment in the lower valve.

EXPLANATION OF THE PLATES.

PLATE XXII.

Fig. 1. *Terebratula caput-serpentis*, young; to show the loop: p. 401.
2. *T. tuberata*, p. 401.
3. *T. trigona*, p. 402.
4. *T. subquadrata*, p. 402.
5. *T. vitrea*; loop: p. 403.
6. *T. vitrea*, var. *sphenoidea*; loop: p. 404.
7. *T. tenera*, p. 405.

PLATE XXIII.

1. *Terebratula septata*, p. 407.
2. *Terebratella spitzbergensis*; loop: p. 409.
3. *Megerlia jeffreysi*; loop: p. 407.
4. *Atretia gnomon*, p. 412.

Fig. 5. *Rhynchonella sicula* (recent), p. 413.
6. *R. sicula* (fossil), p. 414.
7. *Discina atlantica*, p. 415.

Observation.—In the enlarged figure of *Terebratula vitrea*, var. *sphenoidea*, the striæ are much too strongly marked. In the figure of *Discina atlantica* the setæ are represented too thick.

2. On the Male Generative Organs of *Hyæna crocuta*. By M. Watson, M.D., Professor of Anatomy, Owens College, Manchester.

[Received April 5, 1878.]

(Plates XXIV. & XXV.)

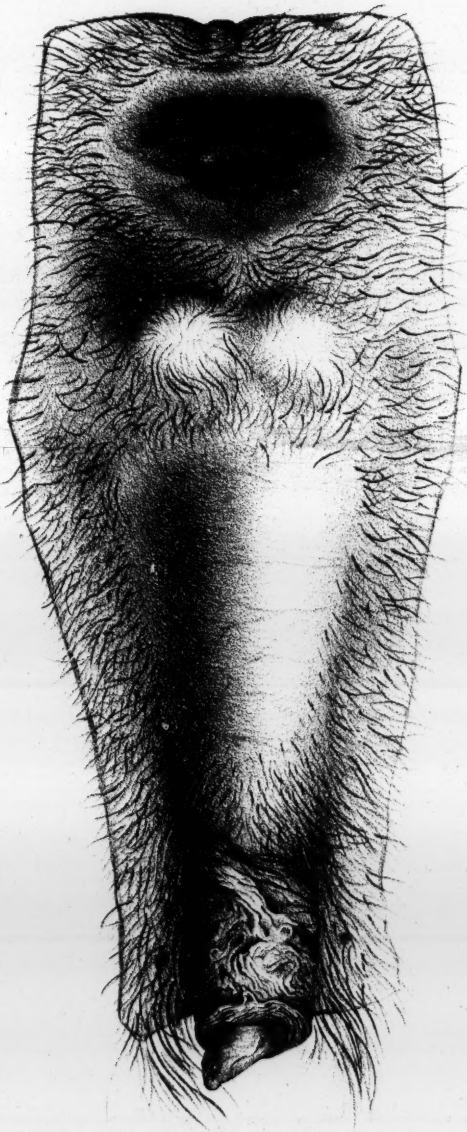
In a previous communication [1] I laid before this Society a description of the female organs of *Hyæna crocuta*, and having lately had an opportunity of examining those of an adult male of the same species, have thought that a description of these would not be altogether uninteresting, more especially as, so far as I can ascertain, no complete account of them has hitherto been published. For the sake of comparison I shall follow the plan pursued in the paper referred to, describing in the first place the external, and secondly the internal organs of generation.

External Parts.

The anal and perineal regions of the male resemble so closely those of the female that without a very accurate examination it is impossible to distinguish between the sexes. In both there is a well-marked glandular pouch above the anus; in both there are cutaneous elevations corresponding in appearance to that of the scrotum in the males of allied species; and in both there is an elongated, pendulous, penis-like body, surrounded by a prepuce, and perforated at its extremity by a single aperture of small size.

Penis.—This organ is directed forwards, and lies along the middle line of the perineum as in the dog. The free portion, consisting of a central glans surrounded by a thick fleshy prepuce, projects forward and downward from the level of the abdominal wall, and measures one inch and a half in length. The glans is conical in form and without distinct corona, the urethral aperture being situated on the apex of the cone. The inferior lip of this aperture is prolonged forward to some extent, so that seen from the side the glans presents the appearance of being obliquely truncated from before backward and upward as in the female, although the truncation is not so well marked as in that sex. In the flaccid condition of the organ the glans is for the most part concealed by the prepuce, its apex only being exposed. The latter portion is of a dark blue colour, and its surface is much corrugated, whilst so much of the glans as is concealed by the prepuce is of a purplish colour and presents no trace of corrugation. Its basal two thirds are moreover covered by small

[1] Proc. Zool. Soc. May, 1877.



Hanhart imp.

ANATOMY OF HYÆNA CROCUTA.



Fig. 1.

Fig. 2.

AHYoung MB del JSmit lith

ANATOMY OF WHEN



Fig. 3.

Hanhart imp.

recurved spines, which diminish in size toward the margin of the prepuce and are altogether absent on its free corrugated portion. The urethral aperture is smaller and less dilatable than the corresponding opening in the female. The prepuce, consisting of a thick double fold of integument of a bluish colour externally and flesh-coloured internally, is thrown into well-marked circular rugæ and is attached by a distinct frænum to the under surface of the base of the glans. When retracted it is continuous with the surface of the latter. In the female the frænum is attached, not to the *base* of the glans, but to the inferior lip of the urino-genital canal.

Perineum.—The perineum, from the inferior border of the scrotum to the base of the free portion of the penis, measures 4 inches in length, a measurement which agrees exactly with that of the corresponding region of the female. The integument, like that of the prepuce is of a bluish colour, smooth, and devoid of hair with the exception of a space immediately behind the free portion of the penis, which space is covered with down of a light yellowish colour, the hairs being directed forwards. It is worthy of note that this area in the male corresponds exactly with that which in the female is studded with the little depressions described in my paper on the genital organs of that sex. And here I would take the opportunity of correcting an error into which I unwittingly fell in that paper. I refer to the statement contained therein that the integument of the female perineum is thrown into longitudinal rugæ. These, as the accompanying drawing shows, are altogether absent in the male in the recent state of the parts, and only manifest themselves subsequent to their immersion in alcohol. As the female organs had been subjected to this treatment previous to their examination, I have little doubt that in their natural condition these parts present the uniformly smooth appearance I have just described in the male animal. The presence of these folds in the female, moreover, induced me to hazard the conjecture that they *might* represent in *H. crocuta* the labia of other carnivora. This supposition is now no longer tenable, as the examination of the male perineum has led me to conclude that the homologues of the labia are not to be sought in the longitudinal perineal folds just referred to, but rather in the cutaneous elevations described in my former paper under the name of "scrotal pouches."

Scrotum.—The scrotum is non-pendulous, and resembles that of the Felidæ proper. It is situated one inch below the margin of the anus; and its division into two is indicated externally by a shallow groove. Each half is about the size of a small walnut; and the surface of each is covered with hair of a light brown colour. It is interesting to observe that this description corresponds almost exactly with that of the so-called "scrotal pouches" of the other sex, the only difference being that in the male the scrotum is slightly more prominent than the "scrotal pouches" of the female.

Anus and Anal-gland Pouch.—The anus is situated one inch above the scrotum; and between the former and the root of the tail is a pouch similar to that which is found in the female. The interior of the pouch is smooth and devoid of hair, except the roof, which is

clothed with down of a lightish colour. The down at the external angles of the pouch is longer than elsewhere, and forms two tufts which project into the pouch. Opening into the bottom of each extremity of this pouch is the duct of an anal gland; whilst extending between these larger apertures is a belt of small perforations, which indicate the ducts of a number of small isolated follicles lying in relation to the fundus of the pouch.

Nipple.—Upon either side of the middle line, and half an inch external to the free portion of the penis, is a single rudimentary nipple. It measures one eighth of an inch in height, and lies concealed in the thick hair of this region.

Internal Organs.

Rectum and Anal Glands.—The rectum occupies the usual position in the pelvis, and is provided with walls of unusual thickness, the external or longitudinal muscular bundles being particularly well developed. It is attached to the lower surface of the sacrum by a double fold of peritoneum or meso-rectum, which measures between two and three inches in breadth, and consequently allows of considerable movement of the rectum within the cavity of the pelvis. The terminal portion of the rectum is surrounded by two muscles, the levator and sphincter ani. 1. The *levator ani* is of considerable strength, and arises from the fascia lining the pelvis. Its fibres pass backward and upward, and terminate on the walls of the rectum under cover of the sphincter ani. 2. The *sphincter ani* is very powerful, and arises from the under surface of that caudal vertebra which is situated directly above the anus, its origin being interposed between those of the depressors of the tail. The muscle is two inches in breadth, and invests not only the extremity of the rectum but also the anal glands together with the pouch into which these open. It is inserted into the skin midway between the anus and scrotum. By means of this arrangement the sphincter ani acts not only as such upon the anus and anal-gland pouch, but also as a compressor of the anal glands. The gland-pouch resembles the corresponding structure in the female, being transversely oval in form. The anal glands are two in number, one being placed on each side of the rectum. They are oval in form and nodulated on the surface. Each measures $1\frac{1}{4}$ inch in length and $\frac{1}{2}$ inch in greatest breadth. They are thus considerably smaller than the corresponding glands in the female, in which they measure $2\frac{1}{2}$ inches in length and $1\frac{1}{2}$ inch in breadth. The gland consists of a secreting wall $\frac{1}{8}$ inch in thickness, which limits a central cavity. From the posterior extremity of this cavity a duct passes off and opens into the corresponding angle of the anal pouch. The cavity of the gland was filled with a thick secretion, which differed from that of the female in being of a blackish colour and in being destitute of the very offensive odour characteristic of that sex. In addition to these larger glands a belt of isolated follicles extends across the bottom of the anal pouch. They pour their secretion into the latter by means of the little apertures above described.

Bladder and Urethra.—The bladder is regularly pyriform and of small size, measuring 4 inches in length. As in the female, it passes gradually into the urethra, so that it is difficult to say where the one ends and the other begins. It is completely covered by peritoneum as far back as the openings of the ureters, and is attached to the pelvic and abdominal walls by reflections of that membrane. The ligaments thus formed are three in number, two being superior and one inferior. Each superior ligament is attached by one extremity to the superior and supero-lateral pelvic wall, and by the other to the lateral aspect of the bladder. Each consists of a double fold of peritoneum, in the anterior or free margin of which is placed the fibrous cord formed by the obliterated hypogastric artery; and crossing the inner side of the latter from before backward as they enter the pelvis are the ureter and the vas deferens, the ureter being uppermost. The inferior vesical ligament is sickle-shaped, and consists of an elongated fold of peritoneum, which extends between the ventral surface of the bladder and the anterior abdominal wall as far forward as the umbilicus. The ureters are remarkably thick and muscular, and open into the base of the bladder half an inch from the orifice of the urethra. The urethra extends from the bladder to the extremity of the penis, and consists of two portions, a membranous and a spongy. The membranous portion lies within the pelvic cavity, and reaches from the neck of the bladder to the bulb of the urethra. It measures 3 inches in length, and is surrounded between the openings of the vasa deferentia and the bulb by a thick layer of circularly arranged muscular fibres, the superficial fibres being attached to the peritoneal fold which intervenes between the bladder and rectum, whilst the deeper fibres are confined to the urethral wall. On slitting open this portion of the canal a well-marked longitudinal fold of mucous membrane is seen to extend along its floor from the neck of the bladder as far as the middle, in length, of the membranous part of the urethra, where it gradually disappears. Upon the summit of this fold, and 1 inch in front of the neck of the bladder, is a circular opening $\frac{1}{8}$ of an inch in diameter. This opening is the mouth of a very minute recess, on the fundus of which the two vasa deferentia terminate. The recess evidently represents the vesicula prostatica, but does not, so far as I could ascertain, form a central *cul-de-sac* extending beyond the openings of the vasa, as it does in another species of this genus. The prostate gland is altogether absent—a fact difficult to reconcile with Professor Flower's observation, that in a preparation of the male organs of *H. crocuta* in the Museum of the Royal College of Surgeons this gland measures "half an inch in length and rather less in breadth"[1].

The spongy portion of the urethra lies within the penis, and measures 8 inches in length. It is surrounded by a layer of erectile

[1] Since the above was in type I have had, through the kindness of Professor Flower, an opportunity of examining the organs from which his description was taken, and can bear testimony to the truth of his observations regarding the presence of a prostate gland. It consisted of two distinct masses, each measuring half an inch in length and a quarter of an inch in breadth, the ducts of

tissue, which is of considerable thickness where it forms the bulb, but is thin elsewhere. Opening into the bulb are the ducts of Cowper's glands.

Testicles and Vasa deferentia.—The testicles are lodged in the non-pendulous scrotum, which is divided into two distinct compartments by a median septum. Each compartment is lined by a tunica vaginalis, which is reflected over the testicle. The cavity of the sac is continuous at the abdominal ring with that of the peritoneum, the communication between them remaining pervious. The testicle is oval in form, and measures $1\frac{1}{4}$ inch in length. The epididymis lies along its lower side, and is expanded above and below to form the globus major and minor. The latter is nearly as large as the former; and the so-called body of the epididymis is consequently reduced to a mere rudiment. The vas deferens, continuous with the globus minor, passes through the inguinal canal, enters the pelvic cavity, where it lies between the layers of the superior ligament of the bladder, and finally sinks into the muscular wall of the membranous portion of the urethra to terminate along with its fellow on the floor of the vesicula prostatica as already described. There are no vesiculæ seminales.

Cowper's Glands.—These are two in number and of large size. Each is placed alongside of the membranous portion of the urethra, in the interval between the levator ani and ischio-cavernosus muscles. Each gland is pyriform, and measures $1\frac{1}{4}$ inch in length, and $\frac{3}{4}$ of an inch in greatest breadth. The base is directed forward; and from the apex is given off a duct $\frac{3}{4}$ of an inch in length, which opens into the roof of the bulbous portion of the urethra. The glands are solid; and each is provided with a capsule of pale muscular fibres.

Penis.—This organ is composed of two corpora cavernosa together with a corpus spongiosum. The former consist of two bands of erectile tissue flattened from side to side as in the clitoris of the female, and united along the middle line. Each is attached to the ischium just in front of the tuberosity of that bone, to form the crus, and unites with its fellow opposite the posterior extremity of the pubic symphysis. The corpus spongiosum is perforated by the urethral canal, and expands anteriorly and posteriorly to form the glans and the bulb. With the exception of these portions, this mass of erectile tissue is thin and contributes no great thickness to the wall of the urethra. The bulb is large and prominent, and is invested by the fibres of the bulbo-cavernosi muscles. The corpus spongiosum of the male therefore differs from the corresponding structure in the female, inasmuch as in the latter this body is divided into two lateral halves which are situated altogether *above* the urino-genital canal, whilst in the former they have coalesced to form a

which open into a little recess on each side of the utriculus. As this animal was *known* to be at least twenty-four years of age, whilst my specimen was not adult, it is *possible* that by reason of their small size the prostate glands of the latter may have escaped my observation. In Mr. Flower's specimen the other generative glands were each twice as large as in my own.

single mass surrounding the canal of the urethra. Further, in the female the corpora spongiosa take no part in the formation of the glans clitoridis, whilst in the male the glans penis is formed by the spongy body. The penis, formed as just described, measures 8 inches in length from the bulb of the urethra to the apex of the glans.

Muscles of Penis.—Of these there are three which are bilateral, and one which is common to both sides. (1) The *ischio-cavernosus* or *erector penis* is very strong, and arises from the ischium immediately in front of the tuberosity. The fibres pass forward and are inserted into the corresponding corpus cavernosum close to the junction of the latter with its fellow on the opposite side. The muscle covers the crus penis. (2) The *bulbo-cavernosus* is also strong, and arises from a median tendinous band which separates it from its fellow. The fibres pass transversely outward so as to cover the bulb of the urethra, and are inserted into the corpus cavernosum along the inner border of the preceding muscle. (3) *Retractor penis.* In my paper on the female organs of *H. crocuta* I expressed my belief that the retractors of the clitoris probably arise from either the ischium or pubis. I am now satisfied from my examination of those of the male that such is not the case, but that in both sexes they arise from the lower surface of the sacrum. In the male each retractor is a broad but thin muscle which, arising from the pelvic surface of that bone, passes backward and downward and reaches the side of the rectum. Some of the fibres terminate on the gut, where they lie under cover of the levator ani; but the greater number form a narrow riband-like muscle, which passes downwards and extends along the under-surface of the penis in contact with its fellow to be inserted, as in the female, into the corpus cavernosum just behind the glans. (4.) *Elevator urethræ.* The muscle so named is very strong, being nearly as thick as the erector. It is a flattened band, and arises from the inner surface of the ischium 1 inch in front of the tuberosity. The fibres pass downward and forward, and terminate below the angle formed by the junction of the membranous and spongy portions of the urethra on a tendon which is common to it and to the muscle of the opposite side. Lying, as it does in the normal position of the animal, *below* the urethra, this tendon when the muscular fibres contract will tend to elevate and at the same time to compress the urethral canal. A large artery, vein, and nerve derived from the pudics pass together along the outer side of each cavernous body as in the female, and terminate close to the glans. Another artery of large size, also derived from the pudic trunk, passes into the crus penis of each side, and apparently supplies the erectile tissue.

Comparison of the Male Organs of allied Species.—Having now described the male organs of *H. crocuta*, it may be well to compare them with those of closely allied species. The number and arrangement of the anal glands is similar in both sexes of this species; and therefore there is little to add to what I have already said regarding them in my communication on the female organs. In my descrip-

tion of these glands in the latter sex I pointed out that in respect of them *H. crocuta* agrees more closely with *Proteles* than with any species of its own genus, and may merely add that the present dissection has enabled me to confirm Dr. Murie's observation [1] that in the male animal as in the female an anal-gland pouch is present. Mr. Busk [2] had previously convinced himself "that no trace of a pouch between the root of the tail and the anus exists, at any rate in the male of this species;" and Dr. Murie, in deference to Prof. Kaup's [3] attempt to classify the Hyænas in accordance with the presence or absence of this pouch, was not prepared to deny that it might *occasionally* be absent in the male. I think this matter may now be considered settled, and may merely observe that Goldsmith [4] appears to have been aware of the presence of this pouch in every species of Hyæna before any of the authors referred to had written on the subject.

With reference to the male organs of allied species, I find that Daubenton [5] describes and figures those of *H. striata*; and these are also referred to by John Hunter [6] and Owen [7]. Cuvier [8] gives an account of the male organs of Hyæna without indicating the species to which they belong; but from the agreement between his observations and those of the authors just named, I presume that *H. striata* formed the subject of his investigations. Of the male organs of *H. brunnea*, so far as I can ascertain, we know nothing; but of those of the closely allied genus *Proteles*, Prof. Flower [9] gives an accurate description. *H. striata* and *Proteles* agree with *H. crocuta* with respect to the form and position of the scrotum, the form of the testicle, and the absence of vesiculæ seminales, whilst they differ from the last-named species in the possession of a prostate gland. Mr. Flower, it is true, refers to the presence of a prostate gland in *H. crocuta* [10]; but of the absence of this in the specimen I examined I was careful to convince myself; and until further observations are made, it is impossible to reconcile these opposing statements regarding a matter of fact. In *H. striata* the prostate is large and consists of two kidney-shaped lobes, whilst in *Proteles* it consists of a single mass of large size having "the appearance of a bilobed disk." Cowper's glands are large and of the same form in all three species, which likewise agree in the form of the bladder and the very muscular character of the ureters. With respect to the vesicula prostatica, Leuckart [11] describes and figures it in *H. striata* as a minute flask-shaped *cul-de-sac* projecting beyond the urethral wall and lying in the interval between the lobes of the prostate. He says, moreover, that in that animal it does not open into the urethra.

[1] Trans. Zool. Soc. vii. p. 503.
[2] Journ. Proc. Linn. Soc. vol. ix. p. 71.
[3] Isis, 1828, p. 1144.
[4] Animated Nature, "Hyæna."
[5] Buffon's Hist. Nat. tom. ix.
[6] 'Essays and Observations,' by Owen, vol. ii. p. 58.
[7] 'Anatomy of Vertebrates,' vol. iii. p. 671.
[8] 'Anatomie Comparée,' vol. v.
[9] Proc. Zool. Soc. 1869, p. 491.
[10] Ibid. p. 493.
[11] 'Cyclopædia of Anatomy,' vol. iv. Art. "Vesicula prostatica."

Mr. Flower found no distinct uterus masculinus in *Proteles*; but as he refers to a median ridge on the floor of the urethra, in which he could detect a very minute aperture, the arrangement appears to be very similar to that described above in *H. crocuta*. In respect therefore of the form of the vesicula prostatica, *H. crocuta* agrees more closely with *Proteles* than with *H. striata*, differing from the latter inasmuch as the vesicula does not project beyond the urethral wall, and in the fact that it communicates with the canal of the same. According to Leuckart it is an extremely rare occurrence that the vasa deferentia open into the vesicula prostatica; but this is certainly the case in *H. crocuta*. The penis of the Spotted Hyæna closely resembles that of *H. striata* and of *Proteles*, differing only from these in the absence of a conical body of cartilaginous consistence which has been described by Cuvier in the glans penis of the former and by Professor Flower in that of the latter. The glans penis in all of them is invested by small recurved spines.

Comparison of the Male and Female Organs of H. crocuta.—When describing the female organs, I remarked that "the arrangement of these is such as to give them a great resemblance to those of the males in other species," and that, if we supposed the vesicula prostatica of the latter enlarged to the size of the female uterus, we should in the absence of a prostate gland, have an almost identical arrangement of the excretory passages of both sexes. The absence, as a matter of fact, of the prostate gland in the male *H. crocuta* makes the resemblance between the male and female organs of this species even greater than I anticipated. And here I may be permitted to observe that nowhere in the group of mammals is the truth of the conclusions at which embryologists have arrived respecting the homologies of the various parts of the sexual apparatus in the two sexes so beautifully shown as in the animal under consideration. Did any doubt remain regarding the similarity of plan upon which these are built up, it would be at once dispelled by an inspection of the sexual organs of *Hyæna crocuta*. In both sexes there is a short urethra opening close to the mouth of the uterus, which organ, in accordance with functional requirements, is of large size in the female, but is reduced to a minimum in the male. In both there is a urino-genital canal extending from the junction of the urinary and sexual canals to the extremity of the penis or clitoris, according to sex; and in both there are two Cowperian glands of large size opening into that canal close to the root of the penis or clitoris. A comparison of the internal genital organs of the two sexes proves conclusively that the lower part of the so-called prostatic, together with the membranous portion of the male urethra, are homologous with the commencement of the urino-genital canal of the female, which canal, in the majority of mammals, is so metamorphosed to form the vestibule, that its homologue in the other sex is by no means readily recognizable. This homology is further substantiated, in the animal we are considering, by the size and form of Cowper's glands, and the points of entrance of the ducts of these into the urino-genital canal in each sex. Lastly, the homology of the so-

called spongy portion of the male urethra with that portion of the urino-genital canal which, in the female, lies in relation to the clitoris, is manifest. The erectile organ is of the same size, and constructed upon the same plan, in both sexes, the only difference being that in the female the urino-genital canal is not surrounded by the erectile tissue of the corpus spongiosum as is the case in the male, this difference being due to the fact that in the latter the essentially bilateral spongy bodies have coalesced in the middle line, whilst in the female, in accordance with physiological requirements, they remain distinct throughout life, and do not surround the sexual canal. In the female, moreover, and associated with this arrangement, there is a complete absence of the elevator urethræ and bulbo-cavernosi muscles.

It may be well now to ascertain whether the examination of this animal throws any light upon the subject of the probable homologues of the vagina and uterus in the male mammal. The majority of embryologists (among whom I may mention the names of Leuckart, Kölliker, and Allen Thomson) are now agreed that the so-called utriculus of the male mammal represents both the uterus and vagina of the other sex, these organs being formed by the coalescence of the ducts of Müller. I have, however, in a previous paper remarked concerning the corpus uteri of the female *H. crocuta*, "That the whole of this is to be regarded as corpus uteri, and not as constituting any portion of the vagina, is proved by the absence of any constriction in its interior which might correspond to an os uteri, the tubular body of the uterus remaining of the same calibre, and having the walls of uniform thickness down to its opening into the urino-genital canal." It is evident therefore that in the female *H. crocuta*, the vagina being altogether absent, we must conclude that in the male of this species the utriculus represents the uterus alone, and not the uterus and vagina together. The same remark holds good, so far as I can ascertain, of only one other placental mammal—that is, of the Indian Elephant, in the female of which, as Mayer[1] pointed out, the vagina is altogether absent, and the uterus opens directly into the urino-genital canal. In the male, therefore, of that animal, as in that of *H. crocuta*, the utriculus, as shown by Leuckart[2], clearly corresponds to the uterus, and to the uterus alone, of the female. With reference to the homologue of the prostate gland in the female mammal, this, according to Prof. Allen Thomson[3], is to be looked for in tissue uniting the urethra with the vagina. We might therefore be justified in expecting that in those animals in the female of which the lower ends of the Müllerian ducts unite to form the uterus and not the vagina, the prostate gland would be absent in the male. Such is certainly the case in *H. crocuta*; but that it would be erroneous to accept this as a general law is proved by a reference to the Elephant, in which, although the vagina is absent in the female, the male nevertheless possesses prostate glands of con-

[1] Nova Acta Acad. Cæs. Leop.-Car. tom. xxii. p. 38.
[2] 'Cyclopædia of Anatomy,' vol. iv., Art. "Vesicula prostatica."
[3] Quain's 'Anatomy,' 8th edit. vol. ii. p. 826.

siderable size. There appears, indeed, upon consideration, to be no reason why these glands should not be present in the males of those species the females of which want the vagina, as well as in those in which that organ is present, seeing that in both cases we have to do with the tissue surrounding the lower ends of the Müllerian ducts.

Turning now to the external genital organs, I have before directed attention to the very close resemblance which in respect of these the male bears to the female, the so-called scrotal pouches and clitoris of the latter closely simulating the scrotum and penis of the other sex. After a very minute examination of these parts in both sexes I have only been able to recognize the following by no means very evident points of distinction between them: (1) In the female the diameter of the free portion of the clitoris, including the prepuce, is greater than in the male, measuring 1½ inch in the former, and 1 inch in the latter. (2) The aperture at the extremity of the clitoris of the female is slightly larger and much more dilatable than the corresponding aperture in the male. This difference depends on the fact that the corpus spongiosum in the male forms the glans penis and completely surrounds the urethral aperture, whilst in the female the upper portion only of the glans is composed of erectile tissue, its lower portion being formed by the walls of the urino-genital canal. (3) The glans penis of the male is covered with recurved spines, whilst the glans clitoridis of the female is devoid of these. (4) In the male the cutaneous surface immediately behind the free portion of the penis is covered with hair, whilst in the female the corresponding space is dotted with the little cutaneous depressions I formerly described, and is devoid of hair.

It will at once be seen that these points of distinction are slight, and are not such as would enable one to decide the sex of the animal in the absence of such an examination as is well nigh impossible so long as the animal is alive.

Bisexual Nature of the Hyæna according to the Ancients.—And this leads me to observe, what I formerly stated, that the consideration of these facts may serve to explain the ideas which were common among the ancient Greeks regarding these animals, namely that they were hermaphrodites. Since the date of my former communication, I have endeavoured to come to some conclusion regarding the origin of this apparently extraordinary belief, with the result that it appears to me that a belief which in our day would rightly be considered altogether absurd, by no means deserves to be so characterized when viewed in the dim light of the knowledge possessed by the ancients respecting these animals. These people had apparently, either directly or indirectly, ascertained certain facts regarding the sexual organs of the Hyæna, which, in the absence of more definite knowledge, almost compelled them to adopt what I may call the bisexual theory regarding them—a view which, as I formerly stated, still obtains among the imperfectly educated Boors of South Africa. Among the Greeks, Aristotle[1] (B.C. 384) appears to have been the first who really investigated the sexual organs of the Hyæna;

[1] 'Historia Animalium,' vi. 32.

but that the genus was well known before his time is proved, first, by the fact that Herodotus[1] (B.C. 484) speaks of the animal as being met with in the Libyan desert, and, secondly, that the view in accordance with which each individual was bisexual, was current before the time of Aristotle, who takes pains to show its absurdity. At a later date Pliny[2] reasserts the bisexual nature of these animals; and his assertion is repeated by Ælian[3]. As, however, with one exception, to which I shall by-and-by refer, the observations of the last two historians do not contain any thing of importance which had not been previously stated by Aristotle, we may confine ourselves to a criticism of the writings of the latter; and by doing so I think we shall throw some light on the origin of the view in question. Aristotle says[4]:—"The Hyæna resembles a Wolf in colour, but is more shaggy, and its back is provided with a mane. It is said that it has the genital organs of both sexes at once; but this is not the case. Its male organ resembles that of the Wolf and Dog; and it has what resembles a female organ under the tail. But this last, although similar to the female organ in form, is imperforate. Underneath this again is the fæcal passage. The female Hyæna has this same so-called female organ situated as in the male, just under the tail; but it is imperforate. Next to this is the fæcal passage; and under this again is the true female organ. The female Hyæna, moreover, possesses an uterus like other female animals. The female Hyæna is rarely caught. Hunters maintain that for ten males they catch but one female." With regard to this passage, the first question that arises is as to the particular species of Hyæna which Aristotle himself examined. There can, I think, be no doubt that it was either *H. brunnea* or *H. striata*, but most probably the latter. His description of the female organs is such as enables us to decide that it was certainly *not H. crocuta*, inasmuch as he says that the gland-pouch had been mistaken for the female organ, showing that the former had some resemblance to the latter. But the female organ of *H. crocuta* bears no resemblance whatever to the gland-pouch; therefore it must have been the female organ of another species to which he referred. In favour of *H. striata* is (1) his observation that the animal is provided with a mane, which, as we know, is more evident in the Striped Hyæna than in *H. brunnea*; and (2) the geographical distribution of the two species—the Striped Hyæna being found in abundance in Northern Africa, with the topography and productions of which the Greeks were well acquainted, whilst *H. brunnea* is confined to the central and southern districts of that continent, districts with which the Greeks were by no means so familiar. But if we come to the conclusion that either *H. striata* or *H. brunnea* formed the subject of Aristotle's investigation, I would point out that in denying, as the result of his observations, the bisexual character of either of these animals, he is attempting to refute a hypothesis the origin of which (as referring to them) it is impossible to explain, seeing that the male and female external organs of

[1] Rawlinson's Herodotus, vol. iii. p. 172.
[2] Pliny, viii. 30.
[3] 'Historia Animalium,' i. 25.
[4] *Loc. cit.*

both species differ widely in appearance, and that consequently the sexes of each are readily distinguishable one from the other.

If this be granted, we need not further attempt to explain an assertion, the origin of which has no foundation in *fact*. But that this hypothesis did originate with reference to either of these species I am not prepared to admit, as it appears to me that the bisexual character attributed to the Hyæna allows of a rational explanation if we regard that character as referring not to either *H. striata* or *H. brunnea*, either of which Aristotle *may* have examined, but to *H. crocuta*, which he certainly did *not* examine. And as further showing that in all probability Aristotle unwittingly mixed up and confounded reports regarding totally distinct animals, I would direct attention to two of the sentences above quoted, in one of which he says, "It is said that it (the Hyæna) has the genital organs of both sexes at once;" and in another "The female hyæna is rarely caught. Hunters maintain that for ten males they catch but one female." Passing over the evident inconsistency of these two statements, I have already shown that the first is inexplicable when applied to either *H. striata* or *H. brunnea*; and, in like manner, the second is equally devoid of meaning when regarded as having reference to either of these species, inasmuch as we have no reason to believe that the proportion in number of the sexes is different in either of them from what it is in other carnivorous mammals, or that the female of either is more difficult of capture than the male. We conclude, therefore, that if the bisexual theory of the ancients regarding the Hyæna had any foundation in fact at all, such fact had reference not to either *H. striata* or *H. brunnea*; and by a process of exclusion we are compelled to regard it as having reference to *H. crocuta*. I have already shown that it is almost impossible to distinguish the female of this species from the male by the mere inspection of the external genital organs; and in this fact lies, as I believe, the explanation of the views held by the ancients regarding these animals. This explanation is moreover borne out by Aristotle's observation that "the female Hyæna is rarely caught," a fact which Pliny also records. The latter historian makes a further, with reference to the present inquiry important observation which is not to be found in the writings of Aristotle. He says, "It is a matter of common belief that the Hyæna is bisexual, *and that it is male and female in alternate years*." It is evident here that Pliny, like Aristotle, mixes up distinct reports concerning the animal, as it requires no elaborate argument to show that were the animal bisexual it did not require to change its sex every year. Be this as it may, it appears to me that if we consider these various statements as referring to *H. crocuta*, the origin of all of them admits of a rational explanation. It might well be that the ignorant traders who trafficked with the natives of the interior of the African continent, observing that all, or at least the majority, of the Hyænas which they encountered were apparently males, should have experienced some difficulty in accounting for the continuance of the species, and have had recourse to the view that each animal was bisexual. It is not improbable that, as Aristotle explains, this view

may have been borne out by the presence of an anal pouch, which, according to him, was mistaken for the female organ—an explanation which is rational enough if we consider that *H. crocuta* formed the subject of the hypothesis, but one which, as I have already shown, loses all its force if we regard it as referring to either of the other species of Hyæna. I would add that the other statements of the historians already quoted, to wit that the Hyæna changes its sex every year, and that the female is rarely caught, are equally explicable in accordance with this view. The first of these I regard as another attempt to solve the problem of generation, seeing that the animals, to the eye of the observer, were uniformly of the male sex; whilst the latter is merely a statement of fact. It may be urged that the geographical distribution of *H. crocuta*, confined as that animal is to the region of Africa lying south of the Sahara[1], and consequently beyond the ken of the Greeks, is against this view. But I may be permitted to point out that it is almost certain that in their time, as now, trading caravans from the coast visited these districts and conveyed to the Greeks information regarding the animals which inhabited them; otherwise it is impossible to account for the accurate knowledge which Herodotus undoubtedly possessed regarding the African continent as far to the south-west as the valley of the Niger[2]. In all probability the statements of travellers regarding the bisexual nature of the Hyæna, originating with *H. crocuta*, were transferred by the Greeks to *H. striata*, with which they were better acquainted—statements which when taken as referring to the latter species are absolutely devoid of meaning, but which, when regarded as applying to the former, admit, as it appears to me, of a rational explanation.

I have, in conclusion, to acknowledge the kindness of Dr. Alfred Young in preparing the illustrations for this paper.

EXPLANATION OF THE PLATES.

Plate XXIV.

View of the male perineum and penis of *Hyæna crocuta*. From above downwards are seen the orifice of the anal-gland pouch, and anus; below the latter is the scrotum, together with the bare perineal integument; lowest of all is the penis, surrounded by its prepuce.

Plate XXV.

Fig. 1. Male generative organs and extremity of rectum of *Hyæna crocuta*. G. P, glans penis; Pr, prepuce; S, scrotum seen from the side; P, penis; C. P, crura penis, covered by the ischio-cavernosi muscles; B. U, Bulb of urethra, covered by the bulbo-cavernosi muscles; R. P, retractor penis muscle; B, bladder; UR, urethra; T, T, testicles, that on the right side lying in its serous sac; V. D, vasa differentia; R, rectum; A. G, anal gland; L. A, levator ani muscle.

Fig. 2. Intrapelvic portion of urethra laid open, showing elevated fold of mucous membrane on its floor, together with the opening of the utriculus on the summit of this fold.

Fig. 3. Glans penis and prepuce of *Hyæna crocuta*. The prepuce is retracted to show the small recurved spines which invest the glans.

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[1] 'Geographical Distribution of Mammalia,' by Andrew Murray.

[2] Heeren's 'Ancient Nations of Africa,' vol. i. p. 192.



♂

J.Gould del. et lith. Hanhart imp.

PITTA KOCHI.

3. Contributions to the Ornithology of the Philippines.—No. VIII. On some Luzon Birds in the Museum at Darmstadt. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received March 27, 1878.]

(Plate XXVI.)

Professor Koch, of Darmstadt, through the obliging intervention of Dr. Brüggemann, has kindly sent to me for examination a small number of birds collected in the vicinity of Manilla by Herr v. Othberg. Though few in number, some of them belong to species of which the Philippine habitat has not hitherto rested on indisputable evidence, while two of them have not before been known as being migrants to the archipelago.

Collocalia fuciphaga.

Hirundo fuciphaga, Thunb. Act. Holm. xxxiii. p. 151, t. iv., "Java;" Walden, 'Ibis,' 1874, p. 135.

Collocalia linchi, Horsf. & Moore, Cat. E.I. C. Mus. i. p. 100. no 123, "Java."

A single example of a species of the genus *Collocalia* was sent by H. v. Othberg to the Darmstadt Museum, and, I am assured by Dr. Brüggemann, was obtained in Luzon. It is not separable from the Javan species, *C. linchi*, H. & M., *i. e.* the true *H. fuciphaga* of Thunberg. No species of the genus has hitherto been known to inhabit Luzon; nor has this species been found in any other Philippine Island.

Turdus obscurus (92).

The Philippine habitat of this Thrush has hitherto rested solely on Prince Bonaparte's authority (Coll. Delattre, p. 28). Three examples from the vicinity of Manilla are sent to me by Professor Koch.

Turdus chrysolaus (93).

The certainty of this Thrush being an inhabitant of the Philippines turned on the authenticity of a skin in Mr. Gould's collection (*cf.* Sclater, 'Ibis,' 1863, p. 197). Four examples from Manilla are in the Darmstadt Museum.

Turdus varius.

Turdus varius, Pallas, Zoogr. R.-Asiatica, i. p. 449.

Professor Newton (Hist. Brit. Birds, pt. iv. p. 254) has remarked that Mr. Gould had received an example of White's Thrush from Manilla. While there could be no possible doubt of the strict accuracy of Professor Newton's determination of the species, I did not

feel quite confident that the origin of the specimen was indisputable (for I had also examined it); and the species was therefore not included by me in my list of Philippine Birds. Professor Koch, however, sends me three examples from Manilla.

ERYTHROPITTA KOCHI. (Plate XXVI.)

Pitta kochi, Brüggemann, Abhandl. naturw. Ver. zu Bremen, v. p. 65, t. iii. f. 6.

Professor Koch has kindly sent me the type specimen of this *Pitta*, from which the accompanying figure is taken. The species is undoubtedly distinct from all the other known members of the subgenus. It is almost as large as *Hydrornis nipalensis*. The tarsus measures nearly two inches. Its specific characters and points of difference are fully detailed by its describer (*l. c.*).

ACROCEPHALUS FASCIOLATUS.

Acrocephalus fasciolatus, G. R. Gray, P. Z. S. 1860, p. 349.
Acrocephalus insularis, Wallace, 'Ibis,' 1862, p. 350.
Calamoherpe fumigata, Swinhoe, P. Z. S. 1863, pp. 91, 293.
Calamoherpe subflavescens, Elliot, P. Z. S. 1870, p. 243.

A single example from Manilla in the yellow under-plumage of *A. fasciolatus*, with which species I identify *A. insularis*. New to the Philippines.

ANTHUS GUSTAVI.

Corydalla gustavi, Swinhoe, P. Z. S. 1871, p. 366; Brüggemann, Abhandl. naturw. Ver. zu Bremen, v. p. 67; Sharpe, Tr. Linn. Soc. ser. 2, Zool. i. p. 338.

Dr. Brüggemann, who first made known the occurrence of this bird in the Philippines (*l. c.*), correctly identified the same example Professor Koch has sent to me. It was obtained by H. v. Othberg near Manilla. Some months later, Mr. Sharpe (*l. c.*) made known that Dr. Steere had discovered the same species in the island of Basilan.

ANTHUS MACULATUS.

Anthus maculatus, Hodgs., Gray, Zool. Misc. p. 83; Tweeddale, P. Z. S. 1877, p. 696.

Two examples from Manilla are sent by Professor Koch. Mr. Everett also procured it at Monte Alban (*cf.* Tweeddale, *l. c.*).

4. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. IX. On the Birds of Antarctic America.

By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.R.S.

[Received April 10, 1872.]

In this report the birds collected at the island of Juan Fernandez, at various points during the subsequent passage along the coast of Patagonia, and at the Falkland Islands are noticed.

The 'Challenger' was at Juan Fernandez from the evening of the 13th to the evening of the 15th of November, 1875, and reached the coast of Patagonia on the 31st December, at Port Otway, east of Cape Tres Montes. On the 1st of January, 1876, a party landed on Penguin Island in Messier's Channel; and the same evening the ship arrived in Cove Bay. On the 2nd January parties were landed on Middle Island, on the 3rd at Gray Harbour, on the 4th at Grappler Harbour, on the 5th and 6th at Tom Bay, near the Trinidad Passage; and small collections were made at each place. On the 8th of January the ship arrived at Porto Bueno, and remained there till the 10th. The same evening a party was landed at Isthmus Bay, and a few birds were obtained. From the 11th to the 13th the 'Challenger' remained at Port Churrucha, and proceeded thence to Port Famine. From the 14th to the 17th she was at anchor off Sandy Point, whence she proceeded through the straits, and anchored about 10 A.M. on the 18th off Elizabeth Island. Leaving the Magellan's Straits, the 'Challenger' arrived at Port Stanley, Falkland Islands, on the 23rd of January, 1876, and remained altogether about two weeks at the Falklands.

During this entire period 169 specimens of birds were collected, which are referable to 41 species.

The ornithology of this part of the world is well known to us from the researches of Darwin, Cunningham, Philippi and Landbeck, and other naturalists[1]. It was not to be expected, therefore, that any novelties would be found during such a cursory passage along the coast.

1. Turdus falklandicus, Q. et G.; Scl. et Salv. Nomencl. p. 2.

619–621, males, 622–625, females, } Juan Fernandez.

"Eyes brown, bill and legs yellow, feet a little darker yellow."

647, male, 648, female, } Gray Harbour, Messier's Channel.

"Eyes brown; stomachs had berries."

685, male, 686, female, } Port Churrucha.

"Eyes brown; stomachs had berries."

[1] See my address on Geographical Zoology in Rep. Brit. Assoc. 1875, p. 105, and my list of papers on the Birds of Chili, P. Z. S. 1867, p. 108.

The occurrence of this Thrush in Juan Fernandez is new to us[1]. The skins from that island do not differ from continental specimens. Specimens 647, 648, from Gray Harbour, Messier's Channel, and 685, from Port Churrucha (obtained in the month of January), are in nestling-plumage. The lower surface is thickly spotted with black; and the back-feathers carry light fulvous shaft-stripes, and are tipped with black.

2. HIRUNDO MEYENI, Cab.; Scl. et Salv. Nomencl. p. 14.

709, male,
710, 711, females, } Sandy Point.
"Eyes black; stomachs had insects."

3. PHRYGILUS GAYI (Eyd. et Gerv.); Scl. et Salv. Nomencl. p. 31.

662, 663, females, Porto Bueno.
"Eyes red; stomachs had sand and grubs."

4. PHRYGILUS MELANODERUS (Quoy et Gaim.); Scl. et Salv. Nomencl. p. 31.

727, male, Falkland Islands.
"Eyes black; stomach had seeds."

5. ZONOTRICHIA CANICAPILLA, Gould; Sclater, 'Ibis,' 1877, p. 47, pl. i. fig. 1.

702, 703, females, Sandy Point.
"Eyes brown; stomachs had insects."
These skins are of young birds, and in a stage in which they cannot be distinguished from *Z. pileata*; but from their locality they should belong to *Z. canicapilla*.

6. CURÆUS ATERRIMUS (Kittl.); Scl. et Salv. Nomencl. p. 38.

645, male, Gray Harbour.
"Eyes black; stomach had insects."

7. CENTRITES NIGER (Bodd.); Scl. et Salv. Nomencl. p. 44.

705–707, males,
708, 708*a*, females, } Sandy Point.
"Eyes black; stomachs had insects."

8. ANÆRETES PARULUS (Kittl.); Scl. et. Salv. Nomencl. p. 47.

665. female, Porto Bueno.
"Eyes grey."

9. ANÆRETES FERNANDEZIANUS, Philippi; Scl. 'Ibis,' 1871, p. 179, pl. vii. fig. 1; Scl. et Salv. Nomencl. p. 47.

606–613, males, Juan Fernandez.
"Eyes white; insects in stomachs."

[1] See article on the Land-birds of Juan Fernandez in 'Ibis,' 1871, p. 178.

10. Elainea albiceps (Lafr. et D'Orb.); Scl. et Salv. Nomencl. p. 48.

688, male, Port Churrucha.
"Eyes black."

11. Tænioptera pyrope (Kittl.); Scl. et Salv. Nomencl. p. 42.

704, male, Sandy Point.
"Eyes black; stomach had insects."

12. Cinclodes patachonicus (Gm.); Scl. et Salv. Nomencl. p. 62.

629, male, } Port Otway.
630, female, }
"Eyes hazel, feet horn-colour.
641, male, } Messier's Channel, Cold Harbour.
642, young male, }
"Eyes brown."
No. 642, obtained Jan. 2, is a nestling lately flown.

13. Scytalopus magellanicus (Lath.); Scl. et Salv. Nomencl. p. 76.

675, male, } Porto Bueno.
676, female, }
Eyes black; stomachs had insects."
680, male, Isthmus Bay.
"Eyes brown."

14. Pygarrhicus albigularis (King); Scl. et Salv. Nomencl. p. 67.

674, male, Porto Bueno.
"Eyes grey; stomach had insects."

15. Oxyurus spinicauda (Gm.); Scl. et Salv. Nomencl. p. 62.

631, female, Port Otway,
"Eyes black; stomach had insects."
664, female, Porto Bueno.
"Eyes brown."
687, male, Port Churrucha.
"Eyes brown."

16. Eustephanus galeritus (Mol.); Scl. et Salv. Nomencl. p. 90; Scl. 'Ibis,' 1871, p. 181.

614–616, males, } Juan Fernandez.
617, female, }
"Eyes black, legs black."
677, male, Porto Bueno.
"Eyes black."
The occurrence of this Humming-bird on Juan Fernandez is now confirmed.

17. Eustephanus fernandensis (King); Scl. et Salv. Nomencl. p. 90; Scl. 'Ibis,' 1871, p. 180.

575–580, 582, 583, 585, 586, 588–592, males, 593, 594, males (young), 595–600, 603, 605, females, } Juan Fernandez.

Of 575 to 592 it is noted by Mr. Murray—"All males, eyes black, feet and bill black; insects in stomachs. This was the most abundant bird on the island apparently. It would seem to be the male of the next lot (595–605)."

Of the last-mentioned lot, Mr. Murray noted, "I think there are strong reasons for believing that these are the females of the preceding. They were several times shot together on the same tree."

There can be no question of Mr. Murray's view being correct. See my notes on this subject in 'Ibis,' 1871, p. 181.

18. Campephilus magellanicus (Gm.); Scl. et Salv. Nomencl. p. 98.

667, male, 668, female, } Porto Bueno.

"Eyes yellow, feet and bill black; stomachs had insects."

19. Ceryle stellata (Meyen); Scl. et Salv. Nomencl. p. 103.

628, male, Port Otway.

"Eyes black, feet yellowish green; stomach was empty."

638, male, Corr Harbour.

"Eyes brown; stomach had fish-bones."

649, male, Gray Harbour.

"Eyes black; stomach was empty."

20. Conurus smaragdinus (Gm.); Scl. et Salv. Nomencl. p. 112.

696, male, 697–699, females, } Sandy Point.

"Eyes red; stomachs had seeds; bill and legs horn-colour."

21. Otus brachyotus (Forst.); Scl. et Salv. Nomencl. p. 116.

712, male, Sandy Point.

"Eyes yellow, bill black; stomach had a mouse in it."

717, male, Elizabeth Island.

"Eyes yellow, cere yellow, bill black; stomach had remains of mouse."

22. Geranoaëtus melanoleucus (Vieill.); Scl. et Salv. Nomencl. p. 119.

713, female, Elizabeth Island.

"Eyes brown; stomach had goslings; cere yellow, tip of bill black, legs yellow."

23. Tinnunculus sparverius (Linn.); Scl. et Salv. Nomencl. p. 121.

700, male, Sandy Point.

"Eyes brown, feet yellow, bill bluish; stomach had remains of mouse."

701, female, Sandy Point.

"Eyes brown, legs yellow, cere yellow, bill blue; stomach had remains of small birds."

715, 716, females, Elizabeth Island.

"Eyes brown, legs yellow, cere yellow."

These specimens all belong to the form kept distinct by Mr. Sharpe (Cat. Birds, i. p. 439) under Swainson's title *cinnamominus*. But when a large series is examined, we find so many intermediate forms between *T. cinnamominus* on the one hand, and *T. isabellinus* on the other, that it seems better to keep these three continental forms all under one specific designation. On the other hand, the insular forms *T. leucophrys* and *T. sparverioides* of Cuba, and *T. dominicensis* of the other Antilles, seem to be fairly distinct.

24. MILVAGO CHIMANGO (Vieill.); Scl. et Salv. Nomencl. p. 122.

669, 670, females, Porto Bueno.

"Eyes brown, feet bluish grey."

695, male, Sandy Point.

"Eyes brown, bill yellowish tinge, legs blue."

25. POLYBORUS THARUS (Mol.); Scl. et Salv. Nomencl. p. 123.

679, male, Isthmus Harbour.

"Eyes brown, bill blue, cere flesh-coloured, and legs flesh-coloured."

684, male, Port Churrucha.

"Eyes brown, cere orange, legs yellow, bill bluish tinge."

26. CATHARTES AURA (Linn.); Scl. et Salv. Nomencl. p. 123.

Œnops falklandica, Sharpe, Cat. Birds, i. p. 27, pl. ii.

731, female, Falkland Islands.

"Eyes brown; had remains of birds in the stomach."

We consider Mr. Sharpe's generic and specific names for this Vulture alike unnecessary.

Illiger, in his 'Prodromus' (1811), gave *two* types for his genus "*Cathartes*," *Vultur papa* and *V. aura*. In 1816 Vieillot made two genera, *Gypagus* for *V. papa* and *Catharista* for *Vultur aura* and *V. atratus*. *Cathartes*, however, has been generally used for the latter group; and there is, in our opinion, no reason whatever for transferring it back to the former, which has an excellent and appropriate name in *Gypagus*. There seem to us no sufficient characters to separate the red-headed and black-headed species of *Cathartes* into two genera.

As regards the Falkland-Island form of *C. aura*, which Mr. Sharpe designates *Œnops falklandica*, the differential character relied upon, which is, apparently, merely the slight greyish-brown margination of the secondaries, appears to us to be insufficient.

27. Nycticorax obscurus, Bp.; Scl. et Salv. Nomencl. p. 126.

655, female, Tom Harbour.
"Eyes orange, feet greenish yellow; stomach had fish.
666, female, Porto Bueno.
"Eyes orange."
737, female, Falkland Islands.
"Eyes yellow; stomach had crustacea."

28. Theristicus melanopis (Gm.); Scl. et Salv. Nomencl. p. 127.

691, male,
692, female, } Sandy Point.
Female, eyes red, feet pink, bill black.
Male, eyes yellow, bill green, legs pinkish with black scales.

29. Bernicla antarctica (Gm.); Scl. et Salv. Nomencl. p. 128.

632, male,
633, female,
634, young,
635, young, } Penguin Islands, Messier Channel.
"Eyes brown, feet yellow; bill of male black, of female flesh-colour; bill of young dark; feet grey-brown; stomachs had pieces of small stones, shells, and sea-weed."
736, female, Falkland Islands.
The two goslings (obtained January 1) are just changing their down, and present the black back, brown head, and barred wings and undersurface of the adult female partially developed. The sex is not noted in either of them.

30. Chloëphaga poliocephala, Scl.; Scl. et Salv. Nomencl. p. 128.

643, male,
644, female, } Gray Harbour.
"Eyes brown, feet and legs yellow and black; stomachs had grass and berries."
658, female,
659, female,
658 *a*, young,
658 *b*, young, } Tom Harbour.
"Eyes brown, bill black, feet yellow and black."

31. Mareca sibilatrix (Poeppig); Scl. et Salv. P. Z. S. 1876, p. 395.

719, male, Elizabeth Island.
"Eyes grey, bill black, feet black; stomach had sand &c."

32. Spatula platalea (Vieill.); Scl. et Salv. Nomencl. p. 130.

694, male, Sandy Point.
"Eyes white, bill black, feet yellow; stomach had pebbles, &c."

33. TACHYERES CINEREUS (Gm.).

Tachyeres cinereus, Scl. et Salv. P. Z. S. 1876, p. 402.
Micropterus cinereus, Cunningham, Trans. Zool. Soc. vii. p. 493.

651, female (young), Messier's Channel.
"Eyes brown; stomach had crabs."
656, young, Messier's Channel.
"Eyes brown, feet and bill black."
657, female, Tom Harbour.
"Eyes brown, bill yellow tipped with black, feet yellow; stomach had small pieces of sand."
678, male, Straits of Magellan.
681, 682, females, Port Churrucha.
"Weighed 8 lb. and 8½ lb."
725, 726, males (young), Falkland Islands.
"Stomach had shells from the kelp chiefly; bill black, feet yellow-brown."

There is nothing in the present series which would induce us to question Dr. Cunningham's view, that the "Flying Loggerhead" is the young of the ordinary species before it gets too heavy for flight. Such a specimen as "No. 681, young female," could evidently accomplish flight, which in large fully adult birds would be probably impossible.

In all the immature birds the bill is uniform black.

34. COLUMBA ŒNAS, Linn.

626, male,
627, female, } Juan Fernandez.
"Eyes orange, feet red, bill black."

No doubt an introduced bird; the two specimens vary in plumage.

35. RALLUS ANTARCTICUS, King; Scl. et Salv. Nomencl. p. 139.

693, female, Sandy Point.
"Eyes red, bill black, feet yellow; stomach had pebbles."

36. VANELLUS OCCIDENTALIS, Harting.

Vanellus occidentalis, Harting, P. Z. S. 1874, p. 451.
V. cayennensis, Sclater, P. Z. S. 1867, p. 331; Scl. et Salv. Nomencl. p. 142 (partim).

722, male, Elizabeth Island.
"Eyes pink, legs pink, bill black at tip, pink at base."

The characters given by Mr. Harting to separate this western form from *V. cayennensis* are slight, but, we think, on the whole, sufficient to justify the employment of his name.

37. HÆMATOPUS LEUCOPUS (Garnot); Scl. et Salv. Nomencl. p. 143.

636, male, Penguin Islands.
"Bill red, legs flesh, eyes orange."

653, female, } Tom Harbour.
654, young, }
"Eyes orange; stomach had mussels."
"Eyes of young were brown, bill of adult red, feet flesh-coloured; bill of young brown."
661, female, Tom Harbour.
720, male, Elizabeth Island.
"Eyes yellow, feet flesh, bill red, eyelids red; stomachs had mussels."

38. Hæmatopus ater (Vieill.); Scl. et Salv. Nomencl. p. 143.

721, female, Elizabeth Island.
"Eyes yellow, feet flesh, bill red, eyelids red; stomach had mussels."

39. Eudromias modesta (Licht.); Scl. et Salv. Nomencl. p. 143.

646, female, Gray Harbour.
"Eyes brown; stomach had insects."
660, female, Tom Harbour.
"Eyes black; stomach had insects."
673, male, Porto Bueno.
"Eyes brown; stomach had seeds and sand."
690, male, Port Fanurie.
"Eyes brown; stomach had sand."
728, male, Falkland Islands.
"Eyes brown; stomach had sandy particles &c."

40. Gallinago paraguaiæ (Vieill.); Scl. et Salv. Nomencl. p. 144.

671, 672, females, Porto Bueno.
"Eyes brown, feet bluish; in No. 672 the feet are yellowish."
729, male, } Falkland Islands.
730, female, }
"Eyes brown; stomachs had worms &c."

41. Tringa fuscicollis (Vieill.); Scl. et Salv. Nomencl. p. 145.

733, male, Falkland Islands.
"Eyes brown; stomach had sand &c."

5. Descriptions of three new Species of Birds from Ecuador. By P. L. Sclater, M.A., Ph. D., F.R.S., and Osbert Salvin, M.A., F.R.S.

[Received April. 11, 1878.]

(Plates XXVII. & XXVIII.)

Mr. C. Buckley, during his recent second expedition into the eastern valleys of the Andes of Quito, has obtained a series of birds



1/3

Hanhart imp.

MEGAPODIUS RADIATUS.



1/2

Lemaire imp.

ARAMIDES CALOPTERUS.

many of which are of great interest, such as *Oreothraupsis arremonops*, Jardine, *Cyanocitta pulchra*, Lawrence, and others. Three species, which appear to be new to science, we propose now to characterize.

1. Buarremon leucopis, sp. nov.

Oleagineo-viridis, suprà valdè saturatior ferè in nigrum transiens; alis extùs, caudâ totâ et capitis lateribus nigris, dorso ferè concoloribus; pileo castaneo; oculorum ambitu angusto albo; rostro nigro, pedibus corneis: long. tota 7·0, *alæ* 3·4, *caudæ* 3·3, *tarsi* 1·1.

Hab. Yauayaca, Ecuador (*Buckley*).

Mus. Salvino-Godmannico.

Obs. Species a *B. castaneicipite*, Scl., cui affinis, dorso obscuro et ciliis albis prorsus distinguenda.

2. Neomorphus radiolosus, sp. nov. (Plate XXVII.)

Cristatus, suprà æneo-niger, frontis et dorsi superioris necnon tectricum minorum plumis fasciis angustis albis aut fulvis transradiatis; tectricibus superioribus et secundariis totis extùs cum dorso inferiore saturatè castaneo-rufis; tectricibus caudæ superioribus et caudâ suprà æneo-viridibus, caudâ parum purpureo tinctâ; subtùs omnino sordidè albus, nigro omnino et frequenter transradiatus, crisso nigricante; rostro pallidè corneo, pedibus obscurè corylinis: long. tota 19·0, *alæ* 6·6, *caudæ rectr. med.* 10·0, *ext.* 6·8, *tarsi* 2·7, *rostri a rictu lin. dir.* 2·0.

Hab. Intaj, Ecuador (*Buckley*).

Mus. Salv.-Godm.

Mr. Buckley sends one specimen of this remarkable Cuckoo, which, though a typical *Neomorphus*, belongs to a very distinct species of the genus, and differs from the four previously known members of this group[1] in being conspicuously banded on the lower surface of the body and round the back of the neck. In its bright chestnut-red wing-coverts it approaches to *N. rufipennis* (P. Z. S. 1849, Aves, pl. x.), but must constitute a third and separate section of the genus, as arranged by Sclater.

3. Aramides calopterus, sp. nov. (Plate XXVIII.)

Suprà saturatè olivaceus, collo postico et pileo concoloribus; dorso inferiore et caudâ nigricantibus; fasciâ colli utrinque latera occupante et tectricum alarium externarum marginibus saturatè rubris; subtùs plumbeus, gulâ albâ; subalaribus nigris albo transfasciatis; primariis intùs nigricantibus; rostro viridi, pedibus rubris: long. tota 13·0, *alæ* 6·5, *caudæ* 2·3, *tarsi* 2·4, *rostri a rictu* 2·0.

Hab. Sarayacu, Ecuador (*Buckley*).

Mus. Salv.-Godm.

[1] Cf. Sclater, P. Z. S. 1866, p. 59, et Lawrence, Ibis, 1873, p. 287.

Obs. Proximus *A. saracuræ*, sed colli alarumque picturâ rubrâ, subalaribus albo-nigris neque rufo-nigris, et primariis nigricantibus nec rufescentibus sanè diversus.

This fine *Aramides*, of which Mr. Buckley has sent two specimens obtained at Sarayacu on the Rio Bobonassa, may be readily distinguished from its nearest ally, *A. saracura*, by the characters given above. Unfortunately, in our "Clavis specierum" of this genus (P. Z. S. 1868, p. 447) we have used the black and white under wing-coverts for the primary division of the genus into two sections. In this respect, however, our new species would come into the second division, although it is certainly most nearly allied to *A. saracura* of the first section.

6. On a new Species of Finch from the Feejee Islands. By Otto Finsch, Ph.D., C.M.Z.S., Director to the Bremen Museum.

[Received March 27, 1878.]

(Plate XXIX.)

Amblynura kleinschmidti, sp. nov.

Supra viridis, subtus lætius tincta; regione parotica viridi-flava; capistro nigro; pileo obscure cyanescente; tectricibus caudæ superioribus læte rubris; subalaribus isabellinis; rostro et pedibus corneo-rubris.

Front, fore part of cheeks to the posterior edge of eye, and chin black; vertex obscure blue; upper surface dark grass green, the same as the outer edge of the remiges, which are blackish brown, like the tail-feathers; upper tail-coverts splendid scarlet-red; underparts grass-green, much brighter and lighter than the upper parts, ear-region bright greenish-yellow; under wing-coverts isabelline; bill and feet horny yellow in the skin, in the living bird apparently flesh-coloured, nails dark brown.

Long. tota,	alæ,	caudæ,	rostr. a fronte,	tars.	dig. med.	
c. 100	63	29	14	21	15	French millim.
c. 4″	2″ 5‴	1″ 1½‴	6‴	8½‴	c. 6‴	English inches.

Hab. Viti-levu, Figi Islands.

Mr. Kleinschmidt, the indefatigable collector of the Museum Godeffroy, discovered this beautiful new species in the interior of Viti-Levu, in November 1877; and I have great pleasure in naming it after its discoverer. The single specimen sent to me by the Museum Godefroy is, no doubt, an old bird: the sex is not marked. This bird belongs to the short-tailed group of Finches, which Reichenbach separated generically, s. n. *Amblynura*, but has a more elongated bill than other species of the genus.



Hanhart imp.

AMOLOPHA KLEINSCHMIDTI

May 7, 1878.

F. Du Cane Godman, Esq., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1878:—

The total number of registered additions to the Society's Menagerie during the month of April was 76, of which 33 were by presentation, 26 by purchase, 3 by exchange, 8 by birth, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 90.

The most noticeable additions during the month of April were as follows:—

1. A Squirrel, from Ecuador (*Sciurus stramineus*), of a species new to the Society's collection.

Mr. Alston, who has been paying special attention to the American Sciuridæ, has kindly furnished me with the subjoined note on this species.

"The Squirrel from Ecuador is certainly the same as Gray's *Macroxus fraseri*[1]; but I am convinced that this is a synonym of *Sciurus stramineus*, Eydoux et Souleyet[2]. *S. nebouxii* of Is. Geoffroy[3] will doubtless prove the same; but I hope very shortly to be able to examine the types of both species. Mr. J. A. Allen[4] has lately referred three specimens from Ecuador to *S. hypopyrrhus*, Wagl., principally on the strength of their harsh sparse fur and long narrow tails. The last, however, seems to me to be a very variable character; and one of these specimens, which Mr. Allen kindly lent me, agrees very well with our bushy-tailed individual, as well as with Gray's types. The irregular white spots and markings seem characteristic of this species, but are not constant, and, when present, vary in every example. *S. stramineus* was described from Omatope, and *S. nebouxi* from Payta, Peru, while *M. fraseri* and Mr. Allen's specimens were from Ecuador."

2. A male Beisa Antelope (*Oryx beisa*), presented by H.M. the Sultan of Zanzibar, and kindly brought home for the Society by Capt. Pasley of H.M.S. 'Simoom,' April 27th.

Our excellent correspondent Dr. Kirk, H.B.M. Consul at Zanzibar, to whose kind offices we owe this valuable animal, tells me that it was obtained in the southern part of the Somáli country. Along with it the Sultan sent a specimen of a "Dwarf Koodoo, quite different from the common species." This would probably be *Strepsiceros imberbis*, Blyth, of which we have never yet received an example.

It is much to be regretted that this animal died on the passage home.

The following papers were read:—

[1] Ann. & Mag. N. H., 3rd ser. vol. xx. p. 430 (1867).
[2] Zool. Voy. la Bonite, vol. i. p. 37, atlas, Mamm. pl. ix. (1841).
[3] Zool. Voy. la Vénus, p. 163, atlas, Mamm. pl. xii. (1855).
[4] Mon. N. Am. Rodent. p. 746.

1. Note on the Stridulating Organ of *Palinurus vulgaris*.

By T. Jeffery Parker, Assoc. R.S.M.

[Received March 27, 1878.]

(Plate XXX.)

On the 5th of March I exhibited to the Society a structure, evidently of the nature of a stridulating organ, which I had found in the common *Palinurus*, and which I then believed had hitherto escaped notice. On the following day, however, Professor Huxley showed me a reference, which he had that morning chanced to meet with, to a paper by Dr. Karl Möbius, in the 'Archiv für Naturgeschichte' for 1867, the title of which, "Ueber die Entstehung der Töne welche *Palinurus vulgaris* mit den äusseren Fühlern hervorbringt," showed at once that I had been anticipated. I hasten, therefore, to render to Dr. Möbius such credit as belongs to the discovery, and take the opportunity, at the same time, of making some criticisms on his paper, as well as a few additional remarks upon the organ in question[1].

The main anatomical features of the stridulating organ are described by Möbius, as they could hardly fail to be, with perfect correctness. He fails, however, to notice either the guiding tubercle (Plate XXX. figs. 3 and 4, *t*), situated just below the ridged pad (*p*) on the antenna, or the groove for its reception on the antennulary sternum (fig. 1, *g*): the former, indeed, is shown in his figure; but no reference is made to it. As I mentioned in my former communication, these structures are of great importance, as by their means the apparatus is brought into gear: when the tubercle does not fit into the groove the pad is no longer in close apposition with the smooth surface of the antennulary sternum, and the antenna moves noiselessly.

As to the functions of the various parts of the apparatus, the account given by Möbius is altogether at variance with my own. He makes the observation that the lower surface of the flap (figs. 1–4, *f*) which plays over the lateral ridge (figs. 1 and 2, *r*) of the antennulary sternum is beset with innumerable close-set minute hairs, inclined with their points upwards, and that, corresponding to these, fine scratches are to be seen on the surface of the ridge itself. All this is perfectly correct: there is no doubt about the presence or the direction of the hairs; and the scratches are quite visible with a hand lens. But Möbius goes on to say that the scratches are produced by the hairs, and that it is the friction of the flap against the smooth edge of the antennulary sternum which produces the sound, by the upwardly directed hairs catching against the surface, when the antenna is moved in the same direction. Of course when the antenna moves downwards the hairs will lie flat and present no ob-

[1] I find that Leach, in his 'Malacostraca Podophthalmata Britanniæ' (1815), mentions the stridulating of *Palinurus*, and correctly ascribes the sound to the friction of the antenna against the "clypeus" (antennulary sternum). He gives, however, no description or figure of the apparatus.

Fig. 1.

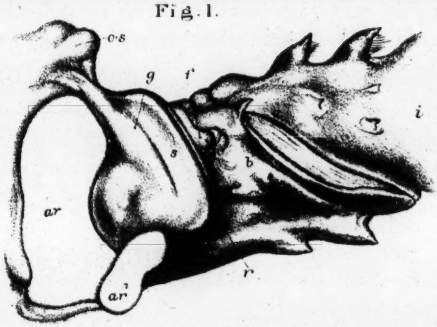


Fig. 6.





Fig. 3.

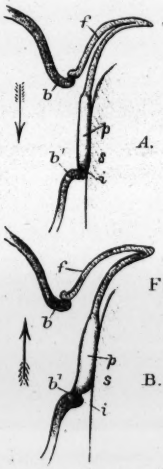
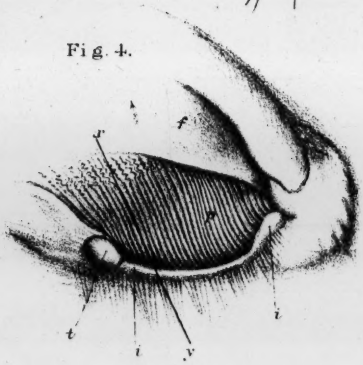


Fig. 5.



Fig. 2.

Fig. 4.



struction; and in this way Möbius attempts to account for the fact that no sound accompanies a downward movement.

As to the first of these statements, one finds it rather hard to believe that hairs so fine[1] that the surface they cover has a texture like that of satin, can produce visible scratches; their effect, one would rather think, would be to impart a fine polish. I should be inclined to suspect that the scratches must be due to fine particles of sand getting in between the flap and the ridge.

With regard to the second statement, that it is the friction of the flap, and not that of the pad, which produces the sound, I can only say that I have removed the flap entirely without any sensible diminution of the noise. The mere observation of the parts while in action is enough to show the true state of things: when looked at from the front it is very evident that the flap exerts hardly any pressure upon the ridge, as, indeed, from the fact that it is a soft structure supported only along one edge, it could scarcely be expected to; while the pad, on the other hand, is completely flattened out against the smooth surface, and in the most perfect contact with it.

It is not easy to see how such a mistake can have arisen; but Dr. Möbius's language is sufficiently explicit to leave no doubt of his meaning. He says:—"Das gefurchte Feld [the ridged pad] bringt keinen Ton hervor, wenn es über die Fläche des Keiles [the antennulary sternum] gleitet. Es leistet aber Widerstand gegen die rückwärts gedrängten Haare, da es dicker und steifer als das behaarte Feld [the flap] ist. Ausserdem geben seine Riefen dem Gange der ganzen Platte grössere Sicherheit, da sie diejenige Richtung haben, in welcher die Bewegungen ausgeführt werden."

The fact that a downward movement of the antenna gives rise to no sound seems to me to be explained by the mode of attachment of the pad. It is connected by its inferior edge (figs. 4 and 5, *i i*) with the lower boundary (fig. 5, *b'*) of the slit or uncalcified portion of the basicerite, while at its superior edge it passes insensibly into the inner wall of the soft flap. The outer wall of the flap, again, is connected with the upper edge (fig. 5, *b*) of the slit in the basicerite. Thus, while the pad is immovably fixed at its inferior edge, it is capable of a considerable amount of displacement in the rest of its extent; and when pressed upon, by the downward movement of the antenna, in the direction from *y* to *x* (fig. 4), it is forced inwards upon the yielding tissue which underlies it, and never comes into sufficiently close contact with the opposing surface to produce a sound (fig. 5, A). But when it is pressed upon, in consequence of the upward movement of the antenna, in the direction from *x* to *y*, the only effect of the pressure is to cause it to bulge out over the line of attachment *i i*, and so come into closer contact with the opposing surface the stronger the force applied (fig. 5, B).

In the matter of histological structure, the pad does not differ from other chitinous membranes, being formed of fine superposed horizontal laminæ, marked by a vertical striation (fig. 5). It is, however, of unusual thickness; and its horizontal laminæ have, for some

[1] They are not more than one seven-hundredth of an inch in length.

distance down, a wavy appearance, corresponding with the ridges into which the surface is raised.

The stridulation is almost equally audible in water and air. As to its production by the living animal, Dr. Möbius states that it was heard by himself and Mr. Lloyd in the Hamburg Aquarium, and that it was made especially when the *Palinuri* were handled; he compares it to the sound produced by pressing the upper leather of a boot against a table-leg. I also heard the sound, and observed the movement of the antenna producing it, in a specimen brought alive to the Biological Laboratory of the School of Mines shortly after making my last communication.

As Dr. Möbius observes, the sound cannot be produced in spirit specimens. These can, however, be again rendered vocal by soaking them for a longer or shorter time in water.

EXPLANATION OF PLATE XXX.

Fig. 1. The parts concerned in the formation of the stridulating organ, seen from the right side (nat. size): *o s*, ophthalmic sternum; *a s*, antennulary sternum; *r*, one of the projecting ridges which bound it anteriorly; *g*, the groove on its lateral surface; *s*, the smooth surface between the groove and the ridge, against which the pad on the antenna rubs; *a r'*, articular cavity for the right antennule; *a r*, articular cavity for the right antenna; *b*, basicerite, and *i*, ischiocerite of the left antenna; *f*, the flap.

Fig. 2. The same, seen from above (nat. size). Letters as before.

Fig. 3. The basicerite and ischiocerite of the left antenna, seen from the inner side (nat. size); the dotted line shows the extent of the uncalcified portion of the basicerite: *p*, the ridged pad; *t*, the guiding tubercle. Other letters as before.

Fig. 4. The pad, with the guiding tubercle and part of the flap (× 4); the arrow shows the direction taken by the hairs on the inner surface of the flap: *i i*, inferior or attached edge of pad; *x y*, line showing direction of movement. Other letters as before.

Fig. 5. Diagramatic cross section of the stridulating apparatus, showing the condition of the parts, (A) when the antenna is moving downwards, (B) when it is moving upwards. The arrows show the direction of movement. *b* upper and *b'* lower lip of the uncalcified slit in the antenna. Other letters as before.

Fig. 6. Microscopical section of the pad, taken across the ridges. Drawn under a ⅛-inch objective.

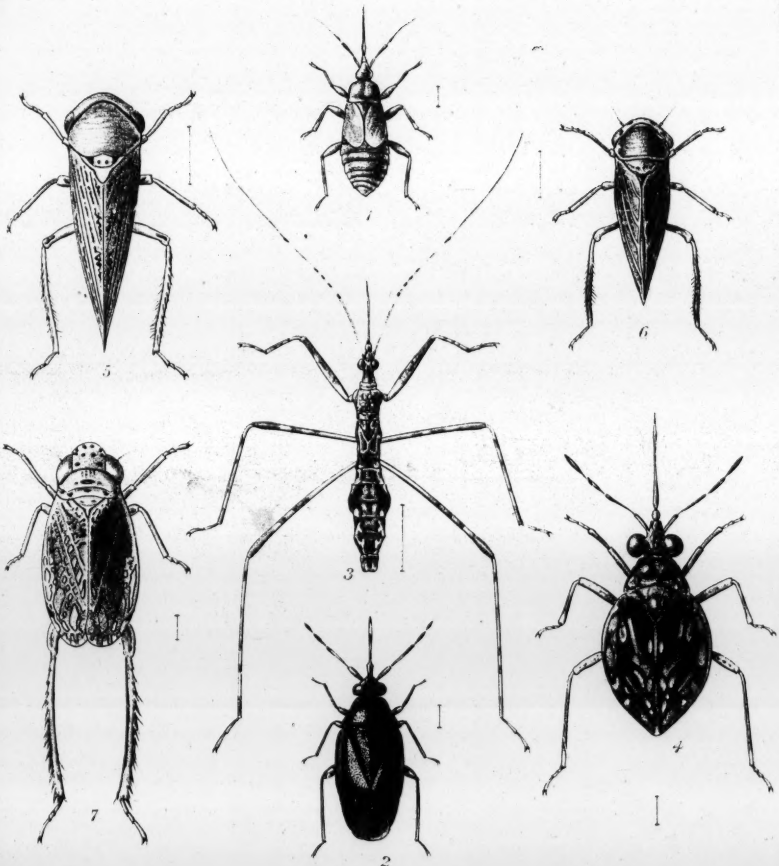
2. Contributions to a Knowledge of the Hemipterous Fauna of St. Helena, and Speculations on its Origin. By F. Buchanan White, M.D., F.L.S.

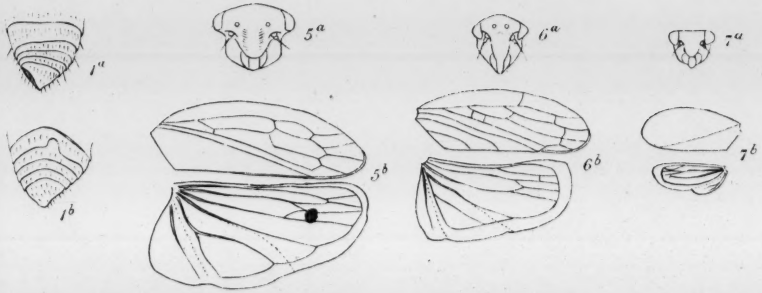
[Received April 8, 1878.]

(Plate XXXI.

Part I. Speculative.

"The extreme isolation of St. Helena—which is nearly 1200 miles from the nearest point of the African continent, 1800 from that of South America, and about 700 from even the small and barren island





Forbes lith

Hanhart imp

HEMIPTERA OF ST HELENA



of Ascension—gives it a degree of importance which it would not otherwise possess; for about the faunas of remote islands cluster, in an especial manner, a variety of problems which, although they may never be absolutely solved, may yet be brought, by a series of carefully conducted observations, within the sphere of discussion, and be made to throw some additional light, however faint, on the general questions of geographical zoology. From whatever point of view we look at them,—and there are many which at once suggest themselves along the distinct, but ultimately converging, lines of thought,—the statistics of an oceanic rock, far removed from the ordinary effects of immigration and change, and bearing more or less of the impress which was stamped upon it by its aboriginal forms of life, have an interest about them which it is scarcely possible to overrate. How the organisms, as we now see them, came to occupy their present areas of distribution,—to what extent they are, or seem to be, 'related' to those of the nearest mainland,—whether there is evidence for believing that they have changed to any considerable extent, in their outward configuration, from the types of which they may be presumed by some naturalists to be the remote descendants,—or whether there is reason to suspect that the Hand, which originally placed them where they are, adapted each separate species to the conditions which it was destined to fulfil, subjecting one and all of them to a law of permanence under which they can never very materially alter,—are but a tithe of the questions which, if not capable of being answered positively, we may at least ventilate and probe, not altogether without profit, in even a small treatise like the present one; for it cannot be too carefully borne in mind that, within the limited sphere where mere speculation (as such) seems likely to have any permanent value, it is to facts, and not to theories, that we must ultimately appeal"[1].

The sentences which I have quoted form, I think it will be admitted, an appropriate introduction to a paper descriptive of one of the last collections of insects ever made by their eminent and much regretted writer; but, before proceeding to the special subject of this memoir, I wish to devote a few words to a consideration of the problems suggested by Mr. Wollaston, not, however, with much hope that I shall be able to throw any fresh light on a matter that has puzzled many abler naturalists.

Of what is actually and satisfactorily known regarding the indigenous animals and plants of St. Helena, the following is a brief epitome:—

There are no terrestrial Mammalia, nor any land or freshwater Amphibia, Reptilia, or Fishes.

Of birds there are at least eight indigenous sea species and one land bird (the *Ægialites sanctæ-helenæ*, Harting, very closely allied to the African *Æ. varius*, Vieill.), which is peculiar to the island.

As regards the sea-fishes, Dr. Günther has, in the 'Proceedings' of this Society[2], given an account of the collections made by Mr. Melliss

[1] T. V. Wollaston, Coleoptera Sanctæ-Helenæ, pp. vii & viii.

[2] March 1868 and April 1869.

These included 65 species, of which 17 are peculiar to St. Helena, 31 others, being inhabitants of shallow water, are probably indigenous (their exotic distribution being for the most part on the American and African coasts), and nearly 20 are deep-water species and common in the tropical seas. Much, however, still remains to be done, not only amongst the fishes of St. Helena, but in the other groups of marine animals.

The land mollusks seem to have been more looked after than the marine species. Of the former, 4 (or, including 2 unnamed slugs[1], 6) living, and 20 dead and subfossil native species have been recorded.

Amongst the Insecta, the order Coleoptera has received most attention; and, owing to Mr. Wollaston's researches, the indigenous species of that order are at least fairly, though, perhaps, not entirely, known. Of the 203 species that have been found in the island, 57 have without any doubt been accidentally introduced; 17 others may have been introduced; and the remaining 129 Mr. Wollaston considered to be the descendants of the "autochthones of the soil," and, with one exception, absolutely peculiar to St. Helena.

Of the Hemiptera a small, but probably fairly representative collection was made by Mr. Wollaston. In it I find 30 determinable species; and 2 or 3 more have been recorded from the island. Of the total number 5 have certainly, and 1 has, probably, been introduced, leaving 26, which, with one exception, seem to be peculiar.

The only other group of animals of which there is (as far as I am aware) any satisfactory record is that of the Spiders, Mr. Melliss's collections[2] of which have been reported on by the Rev. O. P. Cambridge. Out of a total of 40, 18 species seem to be indigenous, and 22 probably introduced.

We will now glance at the flora. The great mass of the present flora consists of introduced species; but of the original flora, as far as it can now be traced[3], 40 flowering plants are absolutely peculiar, and the 5 other probable natives are species of wide-spread tropical distribution. Of the 26 ferns, 10 are peculiar. Adding to these the other cryptogamic plants, so far as they are known, we have a total of 77 plants[4] supposed to be absolutely peculiar to the island.

"Whence and by what means came this very peculiar fauna and flora?" is a question that has given rise to more than one suggestion or theory.

To begin with the flora, Sir J. D. Hooker[5], after alluding to the causes that have assisted in destroying the ancient flora, and indicating the means by which it is possible to distinguish the aboriginal from the introduced plants, proceeds to say:—"From such fragmentary data it is difficult to form any exact conclusions as to the affinities of this flora; but I think it may be safely regarded as an

[1] J. C. Melliss, 'St. Helena,' p. 118.
[2] Proc. Zool. Soc. Nov. 1869 and March 1873.
[3] Sir J. D. Hooker, "Lecture upon Insular Floras," Brit. Assoc. Adv. of Sci. 1866.
[4] Melliss, *l. c.* p. 224.
[5] 'Lecture on Insular Floras,' quoted in Melliss, *l. c.* p. 223, &c.

African one, and characteristic of Southern extra-tropical Africa. The genera *Phylica*, *Pelargonium*, *Mesembryanthemum*, *Osteospermum*, and *Wahlenbergia* are eminently characteristic of Southern extra-tropical Africa; and I find amongst the others scarcely any indication of an American parentage, except a plant referred to *Physalis*[1]. The Ferns tell the same tale: of 26 species, 10 are absolutely peculiar; all the rest are African, though some are also Indian and American. The botany of St. Helena is thus most interesting; it resembles none other in the peculiarity of its indigenous vegetation, in the great rarity of the plants of other countries, or in the number of species that have actually disappeared within the memory of living man . . . . Probably 100 St.-Helena plants have thus disappeared from the Systema Naturæ since the first introduction of goats on the island. Every one of these was a link in the chain of created beings, which contained within itself evidence of the affinities of other species, both living and extinct, but which evidence is now irrecoverably lost. If such be the fate of organisms that lived in our day, what folly it is to found theories on the assumed perfection of a geological record which has witnessed revolutions in the vegetation of the globe to which that of the flora of St. Helena is as nothing!"

Mr. Melliss, whose interesting work on St. Helena I have had frequent occasion to refer to, says[2]:—"Other theories may be appealed to in order to account for the presence and position of this wonderfully curious little flora. Continental land at one time spreading over the South Atlantic Ocean, with its own peculiar flora and fauna, has been started as a plausible theory; but the geological investigation of St. Helena forbids us to look upon it as a remaining portion of some disappearing continent to which the last vestige of a flora, still struggling for existence, may be clinging; and the great depth of ocean[3] around it also seems to deny the possibility of its connexion at any time with either African or American land. Still we cannot tell what geological changes, hundreds or even thousands of centuries may have witnessed in that portion of the globe, leaving, perhaps, this unique little floral remnant, now fast disappearing, as almost the only record of what once was. So far, therefore, the manner in which this once incandescent mass first received its flora, whether by the agency of birds or atmospheric and oceanic currents, or direct from that Hand by which all things were created, still remains unfathomed."

Of the class Arachnida, Mr. Melliss[4] states:—"Mr. Cambridge says, in reference to the character of this portion of the island fauna, after his final examination of the several collections, that 'the European stamp observed upon in regard to the spiders of the former collection is thus equally marked in those now recorded and described.' It is worthy of note that the native Spiders are, almost as a rule, least

[1] Subsequently referred to a new genus, *Mellissia*, Hk. f.

[2] P. 225.

[3] "St. Helena is said to be separated from the continents of Africa and America by a depth nowhere less than 12,000 feet."

[4] *L. c.* p. 206.

abundant now in the island; in each case where I met with only one specimen, it turned out to be a new species. It is therefore not at all improbable that, like the native plants and the Snails, which we know are fast disappearing, some having gone entirely, the Spiders, for some cause or other, are also yielding up their native land to foreign invaders."

Mr. Wollaston, whose painstaking investigations of the faunas of the North Atlantic islands, and careful study of the Coleoptera of St. Helena especially qualified him to give an opinion on this subject, thus writes regarding the Beetles[1]:—"The whole of the 129 species to which I have just alluded are, with a single exception (the *Chilomenes lunata*, Fab.), absolutely *peculiar* to St. Helena; so that the question of geographical distribution would seem to be well-nigh 'nipped in the bud.' Moreover, from all that I know of the South-African Coleoptera . . . . . it has almost nothing in common with these 129 aboriginal St.-Helenians, which stand out singly, as it were, and alone, related more or less *inter se*, but unrelated for the most part, to any recognized continental forms. It is true that two of the most significant of the Rhynchophorous types—namely, *Nesiotes* (of the *Tanyrhynchidæ*) and *Acarodes* (of the *Anthribiidæ*)—are allied conspicuously to *Echinosoma* and *Xenorchestes* of the Madeiran archipelago; but if any more successful generalizer than myself can develop much from these points of quasi-contact, he is quite welcome to the result. So far as I can understand the evidence before me, any unprejudiced inquiry into the 'origin' (as usually understood by that term) of these St.-Helenian Coleoptera, does not elicit, in reply, so much as even an echo; for not only are they *endemic* (in the strictest sense of the word), but an overwhelming majority of them are attached (or were so originally) to trees and shrubs which would seem to exist nowhere in the world except on this remote rock, 1200 miles from the nearest point of the African coast, surrounded by an all but unfathomable ocean, and which has every appearance of having been piled up by successive erruptions into a basaltic mass at no period *very* considerably larger than that which we now see. 'Whence then, came its fauna and flora,' are enigmas which I cannot presume to answer on any known principles of derivation and descent. To a mind which, like my own, can accept the doctrine of creative acts as not necessarily 'unphilosophical,' the mysteries, however great, become at least conceivable; but those which are not able to do this may perhaps succeed in elaborating some special theory of their own, which, even if it does not satisfy all the requirements of the problem, may at least prove convincing to themselves. The St.-Helena fauna cannot, I think, be said to have had much light yet thrown upon it as regards its actual 'origin' (except, perhaps, in so far as my individual opinions on the subject may be accepted by others who are predisposed to receive them); but its *primitive* (or at all events remote) *state* is another matter, and appears to be capable of some real elucidation from the facts to which we have access."

[1] Coleoptera Sanctæ-Helenæ, p. xix.

Regarding the Mollusca, the late Edward Forbes thought that both the terrestrial and marine species dimly indicated a closer geographical relationship between the African and American continents than now maintains. "The marine mollusks would seem to point to the submergence of a tract of land probably linking Africa and South America before the elevation of St. Helena. Along the sea-coast of such a tract of land, the creatures common to the West Indies and Senegal might have been diffused." Commenting on this suggestion, Mr. Gwyn Jeffreys[1] writes, "I am not quite satisfied with this hypothesis, and I believe that more information is needed to support it. . . . . A few of the marine shells are Mediterranean, while the greater number are well-known inhabitants of the Indian Ocean and the West Indies; all these may have originated anywhere. But it must be borne in mind that St. Helena is separated from Africa and South America in every direction and by very deep water, which is nowhere less than 2000 fathoms or 12,000 feet. It therefore seems scarcely probable that such an abyssal and extensive tract of the sea-bed could have been dry land or 'sea-coast' in a geologically recent period, so as thus to account for the diffusion of littoral species such as *Mytilus edulis*, *M. crenatus*, and *Littorina striata*. I should be rather inclined to attribute the present distribution of the marine fauna of St. Helena (not to a supposed continuity of land between Africa and South America in that or any other direction, but) to the action and influence of the great Agulhas current, which issues from the Indian Ocean and flows round the Cape of Good Hope northwards towards St. Helena, and thence past Ascension to the West Indies."

Mr. Andrew Murray, whose loss to science we have had so recently to deplore, has given[2] a considerable amount of attention to the origin of the fauna of St. Helena. After stating his conviction that there at one time existed a land communication, now at the bottom of the Atlantic, between the northern and southern hemispheres, and arguing that there are only three great Coleopterous faunæ or stirpes (the Indo-African, the Brazilian, and what he calls, for want of a better name, "the microtypal stirps"), he proceeds to say:—"St. Helena, that great puzzle of naturalists, is a crucial test to my hypothesis of a communication between the northern and southern hemispheres by an Atlantic continent; if that link snaps, the whole chain will fall to the ground. . . . . I say that its fauna is certainly microtypal, and, if so, almost necessarily a branch of the Atlantic type of that stirps; there is nothing else microtypal for it to be attached to. Some three years ago Dr. Hooker gave an admirable Lecture on Oceanic Islands, in which he discussed the origin of the flora of St. Helena, and on the whole seemed inclined to refer it to Africa. More in the spirit of 'audi alteram partem' than from any settled conviction of my own, I wrote a reply, in which I gave some reasons for thinking that it might more probably have been

[1] Ann. & Mag. Nat. Hist. April 1872; Melliss, *l. c.* p. 114.

[2] "On the Geographical Relations of the Chief Coleopterous Faunæ," Journ. Linn. Soc. xi. no. 49.

originally connected with and peopled from Europe, although, also, possibly connected at some period with Africa. More mature consideration and subsequent researches have confirmed my opinion." Mr. Murray then goes on to point out how the fauna (as then known) supported his conclusions as to its European origin. Of the flora he writes :—"The general result which I draw from the whole flora is, that we have here a compound flora, certainly two deep, possibly three deep. We have, in the first place, I believe, a genuine natural Atlantic (that is, European) flora; for in the face of the decided testimony given by the fauna, I cannot accept Dr. Roxburgh's conclusions as to the supposed introduction and naturalization of every species having a European habitat. If they can be proved to have been introduced, good and well; but I object to take the thing to be proved as part of the proof. And in the next place, I believe, we have the traces of an older African flora (why I call it older I will explain when I come to speak of an ancient connexion between Patagonia and South Africa); and I believe that both are due to actual continuity, however circuitous or interrupted, with the respective countries the impress of whose floras they bear. . . . . .

"Before leaving St. Helena, I have just one other argument to adduce in support of its former connexion with the other Atlantic Islands; and that is, the fact (which has only recently been ascertained, or, at any rate, only recently laid down in our maps) that there is a long band of elevated submarine bottom running north from St. Helena to the Cape-Verd Islands, and embracing in its course Ascension Island and the shoal-ground on the equator."

Subsequently Mr. Murray explains how, in his opinion, there might have been a land connexion between Patagonia and the Cape of Good Hope, "sending out perhaps arms to Tristan d'Acunha and St. Helena, which, however, have the option of what, I think, is a still more ancient union in another direction," namely from Brazil, rounding, but not touching, the Cape of Good Hope to Madagascar. To one or other of these connexions (presumably the first) are owing "the score or so of plants left on St. Helena and Tristan d'Acunha, and a slight sprinkling of microtypal forms which still subsist at the Cape."

I have now given the gist of what I have been able to find suggested as to the origin of the flora and fauna of St. Helena, and, before explaining my own views, will briefly recapitulate.

The facts may be thus stated :—

1. A volcanic island of very ancient origin, very remote from continental land or other islands, and surrounded by an ocean 12,000 feet in depth on almost every side.

2. A terrestrial fauna and flora, the very great majority of the indigenous species comprising which are peculiar, and a marine fauna with a large proportion of peculiar species.

The various theories suggested for the peopling of this island arrange themselves as follows :—

1. Special creation and no special affinities.
2. Land connexion with both Africa and America.

3. As regards the fauna and part of the flora—land connexion from the north, and European affinities.

As regards the peculiar part of the flora—land connexion from the south uniting Africa and America.

4. As regards the marine Mollusca, diffusion by means of the Agulhas current from the south.

5. Affinities of the flora somewhat suggestive of extratropical Southern Africa.

Against the first of these theories (special creation) it may be argued that such a method is contrary to, as far as we can judge, the whole scheme of creation, and that, while many things can be urged against it, there is nothing to support such a belief.

Against the theories which necessitate the existence in time past of a land communication with Africa or America, or both, all the known facts militate. The non-existence in St. Helena of Amphibia and terrestrial mammals[1], the large number of peculiar species, as well as the great depth of the surrounding sea, afford reasons for thinking that it is extremely improbable that the island was ever connected with either of these contiuents.

The other theories will be alluded to in giving my own.

A careful consideration of all the known facts leads me to believe that two, if not three, epochs in the colonization of the island may be distinguished, and that the great bulk of the inhabitants came from the north, but not by means of a continuity of land.

The first of these epochs, or that in which the earliest inhabitants of St. Helena reached the island, occurred possibly early in the last glacial period, but perhaps and (even probably) in Miocene times; and the reasons for thinking so, as well as for believing that the colonists came from the north, I will now try to prove.

In the first place, all the peculiar species belong either to peculiar genera, or to genera which, if they have not yet been found in Miocene formations, are (like the genera which have been found) so widely distributed that it seems more than probable that they were Miocene genera. The nearest relations of the peculiar genera are also of this character.

To begin with the terrestial fauna, viz. the Mollusca, the Coleoptera, the Hemiptera, and the Arachnida.

The molluscan genera are *Succinea* (with a peculiar subgenus), *Helix*, *Bulimus*, and *Achatina*—genera which all date from the Eocene, and which are all very widely distributed.

The Coleoptera, being more numerous, are not so easily disposed of. Taking Mr. Wollaston's estimate of what are aboriginal species, we have 40 genera, of which 25 are peculiar. The remaining 15 genera include 10 actually known as Miocene, 4 of wide distribution and therefore probably Miocene, and 1 which is only known from Madeira in addition to St. Helena. Of the 25 peculiar genera, 21 at least belong to families or subfamilies which are Miocene, and 3 are allied to very widely-spread genera.

The Hemiptera are not many in number, nor is our information

[1] C. Darwin, 'Origin of Species,' 6th edition, p. 350.

about their geographical distribution so complete as it is for the Coleoptera. The total number of genera is 21, of which 8 are peculiar. Of the 13 genera not peculiar, 4 have Miocene affinities, 3 are very widely spread, and 6 are more or less widely distributed, but there is a want of information regarding them. Of the 8 peculiar genera, 4 have Miocene affinities, and 3 have relations of very wide distribution, the remaining genus having African affinities.

As the Hemiptera are specially treated of in the second part of this paper, I need not discuss them at length just now.

The supposed indigenous Arachnida belong to 13 genera, none of which are peculiar. All the genera are widely distributed—many very widely, reaching Australia and New Zealand. One genus is Miocene, and 5 belong to families known as Miocene.

As already mentioned, there are no freshwater fishes; and even if the sea-fishes were more extensively known than they are, the continuity of the medium in which they live affords so many facilities for the distribution of the species, that it is not very easy to learn much from them. Still we find that both the geological age and the present distribution of the 7 families to which the 17 peculiar fishes belong are very great, and that, on the whole, they seem to indicate the same Palæarctic origin as the other classes.

The flora alone remains to be considered. The extratropical South-African affinities of the flowering plants have been pointed out by Sir J. D. Hooker. As to the cryptogams, many have a very wide distribution, either as species or genera; and while many, from their geological age, have had ample time for diffusion, it would seem that even at the present day cryptogams have greater facilities for dispersion than phanerogamic plants. In addition, more information as to their geographical distribution is necessary before they can be considered to throw very much light on the subject we are considering.

The facts connected with the aboriginal fauna to which I have just called attention seem to indicate that its probable origin was somewhat after this manner:—

1. That the first settlers arrived at a very early date, and that no very great additions, from outside the island, were made to them from that period up to the time when man's agency came into force.

2. That they did not arrive in a body, but that the colonization of the island was spread over a considerable period.

3. That the road by which they came was not on a continuous land-surface.

4. That the colonists came from the Palæarctic region.

I shall now endeavour to prove these statements seriatim.

1. *The first settlers arrived at a very early date.*

As, thanks to Mr. Wollaston, the Coleoptera form the best-known group of the animals of the island, we will see how they support my argument. If the colonization did not take place at a very early

period, there ought to be some genera represented (amongst those which are not absolutely peculiar) which are of comparatively recent origin; but the facts are that out of 15 genera not peculiar, 10 are actually Miocene[1], and 4 others are of such wide distribution that, though they have not yet been detected in Miocene formations, they must be of Miocene age. The remaining genus may have either been a later importation, or, what is as likely, originated *en route*. The 25 peculiar genera are all, as I have stated, allied to Miocene, or probably Miocene, families; and their great number is an additional argument in favour of the long isolation and consequent early settlement of St. Helena.

The Hemiptera (so far as our defective knowledge of their geological and geographical distribution goes) tell the same tale. Of the 13 genera not peculiar, 4 have at least actual, and 3 probable, Miocene affinities; of the remaining 6 we know less. Of the 8 peculiar genera, 4 have actual and 3 probable Miocene affinities.

Again, we learn the same thing from the Arachnida. The 13 genera are all probably Miocene, 1 being and 5 belonging to families known as Miocene.

The 4 genera of terrestrial Mollusca are all Eocene; and one has a peculiar subgenus. These quite support the evidence learnt from the insects.

2. *The aboriginal fauna did not arrive all at once, but the colonization was spread over a lengthened period.*

This is a question into which I need not enter at length, but merely refer to Mr. Darwin's remarks on the inhabitants of oceanic islands[2], and point out how the great number of peculiar species in St. Helena bears out his arguments. If all the inhabitants had arrived simultaneously, their mutual relationships would have been undisturbed, and the liability to modification consequently lessened by the absence of new forms of competition. Spread over a lengthened period, the colonization of a new land must inevitably upset the preexisting relationships of the colonists, and result in, as we see in St. Helena, many modifications of form.

3. *The road by which the colonists travelled was not on a continuous land-surface.*

This, too, is a question not requiring lengthy consideration here. The absence of Batrachians and terrestrial mammals is quite in accordance with what Mr. Darwin has shown is the rule in oceanic islands; and, moreover, the argument in favour of gradual colonization also supports that of want of continuity of land-surface.

4. *The colonists came from the Palæarctic Region.*

This is capable of consideration under two headings:—1, the Palæ-

[1] There seems reason to believe that many genera of insects known as Miocene are also of Eocene age.

[2] L. c. p. 348.

arctic character of the fauna; and, 2, the road by which it came; but these will be most conveniently treated of together.

St. Helena is, as has been already said, a small island of ancient volcanic origin, very distant from any continent, and surrounded by very deep sea. The nearest land is Ascension Island, 698 miles north-west of St. Helena; and nearly double that distance north of Ascension lie the Cape-Verd Islands. Improbable as it may seem to many, this is the route by which, I think, the aboriginal fauna reached St. Helena.

But it is not necessary to believe that the colonists crossed such wide stretches of ocean. "Stepping-stones," in the shape of other islands, doubtless existed; and, in fact, we can trace the remains of some of them. For, deep as is the ocean round St. Helena, a somewhat shallower sea (still, however, very deep) extends between it and Ascension, and is continued north to the equator, where a yet shallower place is to be found, not more than 700 or 800 miles from the Cape-Verd Islands. It seems not only possible but extremely probable that in this equatorial shoal we have the wreck of an island; and as the line indicated coincides with an area of depression as well as of volcanic action (extending more or less from Iceland to Trinidad and Tristan d'Acunha), there is no reason why other islands should not have existed, of which (as Mr. Darwin says) "not a wreck now remains."

It may be argued against this theory that, if it were probable, then Ascension should have a larger native fauna than it at present possesses; but, as far as I can learn, the present Ascension is of comparatively recent origin, and supplies an argument in favour of my view that volcanic action has made great alterations in the supposed line of route. If (as seems probable) the present Ascension is comparatively recent, it by no means follows that an older island did not once occupy its place and possess a larger fauna than its successor, which has been possibly colonized from St. Helena. (I may here call attention to Mr. Melliss's remarks[1], that *Sterna fuliginosa* does not remain all the year at St. Helena, but probably migrates to Ascension, returning to St. Helena at the end of the year. If there is any thing in Mr. Wallace's theory that the lines of migration of birds often coincide with ancient land-connexion[2]—which, however, Colonel Drummond Hay has shown[3] to be by no means invariably the case—then this would seem to point at some closer connexion in former times between St. Helena and Ascension.)

But even assuming that the supposed requisite intermediate islands existed, it is necessary to find some means by which the tide of emigration was induced to flow towards St. Helena.

At the present time both the ocean-currents and the prevailing winds would tend to lessen, if not, as seems more probable, to entirely prevent, emigration in that direction, even if the "stepping-stone" islands still existed. The S.E. trade is the prevailing wind; and the great Agulhas current sweeps past St. Helena from the

[1] *L. c.* p. 98. [2] Geographical Distribution of Animals, i. p. 22.
[3] Scottish Naturalist, 1877-78.

Cape of Good Hope towards the West Indies, and, while effectually stopping any emigration from the north, does, in fact, occasionally (as we shall presently see) bring new inhabitants to the island from the south. Given, therefore, any cause by which the present direction of the winds and currents could be reversed, the probability of colonization from the north would be immensely increased. But when we find, as in reality we do, that one and the same cause not only reversed the winds and currents, but induced an immense tide of migration to flow from the north to the south, then it seems pretty evident whence St. Helena derived its fauna, if that fauna be, as I shall presently show it is, of a Palæarctic character.

The cause I have alluded to is one or other of the northern glacial periods, either the last or one in Miocene times. That during such a period the equatorial currents were reversed, Dr. Croll[1] has shown there are very good reasons for believing; and as regards the flow of migration southwards at the same time, we know that that must necessarily have taken place[2].

But perhaps it may be argued that similar reasons to those which I have advanced to show that the colonization was from the north may be brought forward to prove, with as great probability, that the colonization was from the south. We have seen, however, that the present configuration of the sea-bottom is much more in favour of the northern than of the southern theory; we, know, moreover, that emigration from the north has always been more powerful than from the south; and I will try to show that the character of the fauna is in favour of the northern view.

It is now generally admitted that the Cape-Verd Islands belong to the Palæarctic region, and have derived their fauna through the Canaries and Madeira. If, then, St. Helena got its fauna by that route from the north, the affinities should be Palæarctic, and the imprint of the fauna of the route should be more or less discernible. That this imprint is not more manifest is explained, I think, by reason that the route was interrupted at the St.-Helena end, and that island cut off, at a very remote date; the other islands being less inaccessible, have had their faunas altered very considerably by later importations, and their original settlers less modified by the fact that the colonization was more *en masse* and that fresh blood has tended to preserve the old types.

Mr. Wollaston, whose opinion must be received with the greatest respect, arrived at the conclusion, as I have already mentioned, that St. Helena had little in common with the faunas of the Atlantic archipelagos to the north; but even he admits that "two of the most significant of the Rhynchophorous types—namely *Nesiotes* (of the *Tanyrhynchidæ*) and *Acarodes* (of the *Anthribiidæ*)—are allied conspicuously to *Echinosoma* and *Xenorchestes* of the Madeiran archipelago."

Most of the coleopterous genera not peculiar to St. Helena have already been cited in evidence of the very ancient peopling of the

[1] Quoted in Dr. J. Geikie's 'Great Ice Age,' p. 107. &c.

[2] Darwin, *l. c.* p. 339. &c.

island. Most of these genera, in addition to being Miocene and of very wide distribution, are characteristic Palæarctic genera at the present time. Amongst the peculiar genera many have their affinities (and, hence, probable ancestry) with Palæarctic genera; while in the North-Atlantic islands there seems to me to be more evidence of alliance with St. Helena than Mr. Wollaston was inclined to admit. Mr. Murray (whose line of migration, in part, at least, coincides, as will have been noticed, with mine—he arguing, however, for continuity of land) was decidedly in favour of affinity with the North-Atlantic islands; and his knowledge of Coleoptera was, it must be allowed, so extensive as to require his opinion to be received with attention. It is true that since he wrote on the subject our knowledge of the St.-Helenian Coleoptera has been immensely increased; but so far as I can see, nothing has been found to invalidate (but rather to increase) the argument in favour of such alliance. Taking Mr. Murray's abstract[1] of the Coleoptera of the North-Atlantic islands, we have in Madeira 266 endemic species against 120 aboriginal European species, the endemic species being all akin to European forms. Then in the Canaries we find that, out of a total of 930, 224 species are identical with Madeiran, the peculiar characters of the Madeiran fauna being there in force. Next come the Cape-Verd Islands, of which Mr. Wollaston says, "Our recent explorations in the Cape-Verdes have shown their coleopterous population to be so far more than I had anticipated on the Canarian and Madeiran type, that I am any thing but certain that it would not be more natural to regard the *whole* of these Atlantic islands as characterized by a *single* fauna unmistakably the same, even whilst necessarily differing as to many of its exact details (and through the fact of mere *distance*) in the more widely separated groups."

In fact we find in the three archipelagos just what might have been expected. As we move southwards the same general character of the fauna is found to be present, but the particulars gradually alter. And this, it seems to me, is apparent even when St. Helena is reached. Making due allowance for its remoteness and different latitude, the character of the fauna is the same, though the details are very considerably altered. For example, in Madeira we have the Heteromerous genera *Hadrus* and *Hegeter*, with 3 and 1 species respectively; in the Canaries *Hadrus* has vanished, but *Hegeter* has no less than 19 species; in the Cape-Verds *Hegeter* has almost disappeared, having but a single species, but its place has been taken by a new genus, *Oxycara*, with 10 species; in St. Helena all these genera have vanished, but are represented by two new and allied genera—*Hadrodes* and *Tarphiophasis*, regarding the first of which Mr. Wollaston remarks that it has a good deal in common with the Madeiran *Hadrus*. *Tarphiophasis* too seems evidently a development of *Hadrodes*, just as the latter is of *Hadrus*. Then, again, Mr. Wollaston remarks of the St.-Helenian *Opatrum hadroides* that it is closely allied to species from the Cape-Verd, Canarian, and Madeiran archipelagos, and is even more akin to one, and probably

[1] *L. c.* p. 12 &c.

identical with another, Cape-of-Good-Hope species—the significance of which latter facts will be alluded to in connexion with the flora. Again, the genus *Euxestus* was known from Madeira only, till Mr. Wollaston discovered another species in St. Helena.

But as the most remarkable fact in the coleopterous fauna of St. Helena is the enormous preponderance of *Cossonidæ*—more than a quarter of the endemic species belonging to that family—which seem to find there their metropolis, we ought, if the line of migration is by Madeira &c., to find in the latter a significant development of this family. And so we do. "In the Madeiran and Canarian groups," writes Mr. Wollaston[1], "there is scarcely any fact [the insular-loving nature of the *Cossonidæ*] more distinctly observable—where every detached rock is tenanted by some one representative, or more, of this particular department. Nor are trees and shrubs (which seldom flourish in localities thus weather-beaten and exposed) by any means essential for their support, the pithy stems of the ordinary plants being amply sufficient to sustain them; and I have frequently found the stalks of dead thistles and Umbelliferæ to be perforated through and through by their ravages." Mr. Wollaston found 19 species in Madeira and 14 in the Canaries. The *Anthribiidæ* (which include the next largest number of endemic species in St. Helena) indicate a like derivation; but enough has, I think, been brought forward to show both the Palæarctic origin and probable route of migration of the Coleoptera of St. Helena.

The Hemiptera are not fitted (from the reasons already given) to teach us so much as the Coleoptera; but 12 at least, if not all, of the 13 non-peculiar genera are Palæarctic, and many of them Madeiran. The peculiar genera have also nearly all strong affinities with Palæarctic genera. Just as the whole facies of the Madeiran Hemiptera is European, so that of the St.-Helenian is Madeiran and European.

The characteristics of the Arachnida and of the terrestrial Mollusca have already been pointed out.

But let us now see if there be any thing in the manner of life of the aboriginal animals of St. Helena which would make their passage across the sea not only a possible but a probable occurrence. If we can find that a majority of them are connected with plants, it is not difficult to imagine how they might have been drifted by sea-currents to the island; but if, in addition, it turned out that many inhabited the interior parts of plants, their carriage across the sea would pass from the region of possibility into that of probability. Mr. Wollaston has carefully recorded the *modus vivendi* of the St.-Helenian Coleoptera; so we will try and prove our case from his evidence.

At least half of the 12 endemic species of the genus *Bembidium* have the very abnormal habit, for that genus, of living *within* the dead and rotting stems of the tree ferns. (I may note here that in the Madeiran group 10, in the Canaries 14 (7 peculiar), and in the Cape-Verds 5 species of the genus have been found.) The following St.-Helenian genera are also, amongst others, especially

[1] Trans. Entom. Soc. London, 1873, iv. p. 433.

wood-frequenting—*Anchastus*, *Anobium*, the 17 genera of *Cossonidæ*, *Nesiotes*, &c.

Thus 16 out of the 25 peculiar genera, and nearly 80, at least, out of the 129 peculiar species, live *in* wood at some period of their existence. The *Anthribidæ*, of which 26 species occur in St. Helena, are not wood-borers, although probably lignivorous as larvæ, but cling rather tenaciously to foliage, dead wood, &c.; and they, as well as most of the remaining Coleoptera as well as the species of the other groups which are also attached to plants, must be specially liable to transportation in or about drift-wood, &c. In the case of winged species the winds, of course, would assist in the work.

But it is unnecessary to pursue this subject any further, save to mention that though most of the plant-frequenting beetles are attached to some one or other of the peculiar plants, it by no means follows that their ancestors were so restricted; for, as observed by Mr. Wollaston, some at the present day devour with apparently equal relish, the native arborescent Compositæ and the introduced Coniferæ. Nor is it necessary to suppose that they were introduced with the tree Compositæ, because it is probable that the progenitors of the latter were not arborescent when they arrived in the island, but that that condition was gradually evolved[1]. Some of the *Cossonidæ* are quite content with the pithy stems of thistles &c., though the family is essentially wood-loving.

It is also worth while noting the extreme paucity of that section of the Coleoptera known as the *Phytophaga*, which seems to show not only that the lignivorous beetles had more facilities of transport than those that merely fed upon the leaves of plants, but that, as Mr. Wollaston remarks, the early flora of St. Helena was essentially a woody one. Now that the forest has vanished, and though the greater part of the island is suited for the *Phytophaga*, yet the number of species remains the same—showing, I think, that colonization (apart from that brought about by man's unintentional agency) is not now going on.

A word now as to the flora. The aboriginal plants have, as has been already said, most affinity with the flora of Southern extra-tropical Africa. This affinity can surely only arise from a common origin; and if, as I have attempted to prove, the origin of the fauna is Palæarctic, it seems reasonable to suppose that the origin of the flora is the same, and that the same agencies which brought its fauna to St. Helena brought its flora also. Without going into details of the South-African flora (for which, indeed, I have not the materials), I may mention that there are one or two genera of plants common to it and to St. Helena which are strongly suggestive of a Palæarctic origin and dispersion by the influence of a glacial epoch:—for example, *Sium*, which has an endemic representative in St. Helena; the very characteristic Cape genus *Pelargonium*, which has a straggler in Syria (where, be it noted, the endemic St.-Helenian coleopterous genus *Haplothorax* has, according to Lacordaire, its nearest allies); and others.

[1] Darwin, *l. c.* p. 350.

Here I may be permitted to quote a remark by Mr. Darwin on this point[1]:—"In Africa, several forms characteristic of Europe and some few representatives of the flora of the Cape of Good Hope occur on the mountains of Abyssinia. At the Cape of Good Hope a very few European species, believed not to have been introduced by man, and on the mountains several representative European forms are found which have not been discovered in the intertropical parts of Africa. Dr. Hooker has also lately shown that several of the plants living on the upper parts of the lofty island of Fernando Po and on the neighbouring Cameroon Mountains, in the Gulf of Guinea, are closely related to those on the mountains of Abyssinia, and likewise to those of Temperate Europe. It now also appears, as I hear from Dr. Hooker, that some of these same temperate plants have been discovered by the Rev. R. T. Lowe on the mountains of the Cape-Verde Islands. This extension of the same temperate forms, almost under the equator, across the whole continent of Africa and to the mountains of the Cape-Verde archipelago, is one of the most astonishing facts ever recorded in the distribution of plants"[2]. Mr. Darwin then proceeds to show how in a glacial epoch the temperate flora might have invaded the whole of Africa, and at the return of warmer conditions been driven up the mountains, or in some cases become gradually acclimatized.

In connexion with this possible, and, as it seems to me, probable, community of origin of the floras of the Cape (in part) and of St. Helena, the significance of the occurrence at the former place of several Coleoptera and Hemiptera closely allied to, if not identical with, St.-Helenian species, is not to be overlooked[3].

It is not to be wondered at, then, that we do not find, in the parts of Africa nearest St. Helena, much, if any, relationship to the island fauna and flora. That such relationship, so far as community of origin is concerned, once existed, I have little doubt; but the return to tropical conditions and the reestablishment of the tropical fauna and flora have obliterated, except on the mountain-summits, all traces. And St. Helena by its isolated position and temperate climate (the mean temperature of the year being only about 61°) is to all purposes a mountain.

The affinity of the Hemipterous genus *Megarhaphis* to the African *Macrorhaphis* (of which one species is from the Cape, and the other—rather doubtful as to the genus—is from the Congo) seems to be an exception; but as we do not know the exact nature of the locality whence the Congo species was derived, and as it is as likely as not to be a mountain and not a tropical insect, it may after all prove our case by being a descendant of one and the same Palæarctic ancestor as the Cape and St.-Helenian species.

There still remain some elements in the fauna and flora of St. Helena to be accounted for.

[1] Origin of Species, p. 337.

[2] See also Professor Oliver's 'Flora of Tropical Africa,' in which the occurrence of several species, not only European but even Arctic, is recorded.

[3] Certain European Hemiptera are also natives of the Cape.

For example, there is the one peculiar land-bird, *Ægialites sanctæ-helenæ*, which is so closely allied to African species that it is, in all probability, a comparatively recent introduction. It seems rather remarkable that there are not more peculiar land-birds; and the absence of Bats (none of which are recorded by Mr. Melliss) is another curious feature in the fauna of the island.

There are also the species of West-Indian fish and marine Mollusca as well as the Indian-Ocean species of the same groups. Not very much can be made out of our present knowledge of these; but it seems to me that no great obstacle exists to their introduction by means of the ocean currents. The present currents might have brought the southern and eastern species, while the reversal of the currents during a glacial period would bring the West-Indian and Brazilian animals. Though I have already invoked the agency of a reversed current for the purpose of bringing the Palæarctic fauna to the island, I think it is improbable that the arrival of the West-Indian fish at St. Helena was contemporaneous with that of the ancestors of the endemic fauna, though, in the case of some of them, it is quite possible. I would rather suppose that, since they are species of presumably later origin (or, should their origin be as remote as that of the endemic species, yet it was elsewhere than at St. Helena), they were brought to the island during a later (or a later part of the last) glacial period than the ancestors of the endemic species.

There are also certain elements in the flora, viz. the five tropical weeds or sea-side plants of very wide distribution, which Sir. J. Hooker refers to. These are almost certainly of later introduction than the endemic and peculiar flora. Mr. Melliss remarks[1] of *Entada scandens*, L., that the large seeds "are cast ashore on the windward side of the island, having been brought from the Mauritius, or elsewhere, by sea-currents. They have been *known to germinate*; but it is doubtful if one now exists there." This fact is suggestive of the origin of the five plants alluded to, as well as of some others thought by Mr. Melliss to be indigenous.

Part II. Descriptive.

In his recent work upon St. Helena, Mr. Melliss was able to record the occurrence of only 8 species of Hemiptera. The names of only five species had apparently been determined; and of these 4 were evident introductions.

It was therefore left to Mr. Wollaston to add considerably to our knowledge of the St.-Helenian species of this order. The list which I now submit to the Society embraces the results of his six months' exploration of the island; and though it probably does not include all the native species, yet there is reason to suppose that the collection is a very representative one.

A few months before his lamented death, Mr. Wollaston placed the collection in my hands for determination, with directions that a

[1] *L. c.* p. 266.

"set of types" should be placed in the British Museum, and that the new species should be described in a single paper and not piecemeal. The first of these requests I have already carried out; and the second I now proceed to fulfil. The type specimens of *all* the new species, as well as a larger number of specimens in cases where the species was represented by more than two individuals, will be found in the British Museum.

The following is a list of the species in the collection:—

Order HEMIPTERA.

Suborder HETEROPTERA.

Fam. CIMICINA, Stål.

Subfam. ASOPINA, Stål.

1. *Meyarhaphis wollastoni*, Buchanan White.

Subfam. PENTATOMINA, Stål.

2. *Nezara viridula*, L.

Fam. LYGÆIDÆ, Stål.

Subfam. BERYTINA, Stål.

3. *Metacanthus concolor*, Buchanan White.

Subfam. LYGÆINA, Stål.

Div. ORSILLARIA, Stål.

4. *Nysius sanctæ-helenæ*, Buchanan White.
5. *Nysius thymi*, Wolff, var.

Fam. CIMICIDÆ, Stål.

Subfam. ANTHOCORINA, Reut.

Div. ANTHOCORARIA, Reut.

6. *Hapa contorta*, Buchanan White.
7. *Cardiastethus bicolor*, Buchanan White.
8. *Lyctocoris campestris*, F.

Div. MICROPHYSARIA, Reut.

9. *Myrmedobia fuliginea*, Buchanan White.

Subfam. CAPSINA, Reut.

Div. PHYTOCORARIA, Reut.

10. *Calocoris* (*Megacœlum*) *lustratus*, Buchanan White.

Div. CYLLOCORARIA, Reut.

11. *Orthotylus mutabilis*, Buchanan White.

Div. CAPSARIA, Reut.

12. *Lygus apicalis*, Meyer.

Div. PLAGIOGNATHARIA, Reut.

13. *Agrametra æthiops*, Buchanan White.
14. *Psallus flavosparsus*, Buchanan White.
15. *Psallus lutosus*, Buchanan White.
16. *Psallus vinaceus*, Buchanan White.

Fam. NABIDÆ, Stål.

Subfam. NABINA (=CORISCINA, Stål).

17. *Nabis capsiformis*, Germ.
18. *Vernonia wollastoniana*, Buchanan White.

Fam. SALDIDÆ.

19. *Salda aberrans*, Buchanan White.

Suborder HOMOPTERA.

Fam. FULGORINA.

Subfam. ISSINI.

20. *Issus coleoptratus*, F.

Subfam. DELPHACINI.

21. *Liburnia* (*Ilburnia*) *ignobilis*, Buchanan White.

Fam. JASSINA.

Subfam. BYTHOSCOPINI.

22. *Stonasla undulata*, Buchanan White.
23. *Stonasla consors*, Buchanan White.
24. *Nehela vulturina*, Buchanan White.

Subfam. ACOCEPHALINI.

25. *Argaterma ulticola*, Buchanan White.
26. *Argaterma multisignata*, Buchanan White.

Subfam. JASSINI.

27. *Grypotes* (?) *insularis*, Buchanan White.
28. *Thamnotettix sanctæ-helenæ*, Buchanan White.
29. *Jassus wollastoni*, Buchanan White.

Subfam. TYPHLOCYBINI.

30. *Chlorita edithæ*, Buchanan White.

There were besides in the collection several species in immature condition and hence undeterminable. One of these species, which is a native of the high central ridge, appears to belong to the Coreini; and any future explorer of the island would do well to search for it. To the list must also be added *Acanthia lectularia*, L., a doubtless introduced species recorded by Mr. Melliss, and *Cixius sanctæ-helenæ*, Stål (Eugenies Resa, Entomol. Bidr. 272. 148), a probably endemic species. Mr. Melliss also mentions the occurrence of several

Aphides and *Cocci*. Of the 30 determinable species in Mr. Wollaston's collection 5 species—

Nezara viridula, L.,	*Nabis capsiformis*, Germ.,
Lyctocoris campestris, F.,	and
Lygus apicalis, Meyer,	*Issus coleoptratus*, F.,

have been probably introduced since the island was discovered. The species which I have referred to *Nysius thymi*, Wolff, may also be an introduction; but I am more inclined to consider it a native.

The remaining 24 species seem to be all peculiar to the island; and for the reception of 10 of them I have been obliged to create 7 new genera and 1 new subgenus. Mr. Wollaston has not, unfortunately, recorded for the Hemiptera, as he has done for the Coleoptera, the special *modus vivendi* of each species; but as the particular part of the island inhabited by each was briefly noted by him, I have been careful to give all the information I can.

Megarhaphis, gen. nov.

Genus Macrorhaphidi *valde affine. Caput apice subtruncatum, lobis æquilongis. Rostrum articulo* 2° 4°*que subæquilongis, singulatim* 3° *longioribus. Thorax marginibus lateralibus subcallosis, vix tranversim rugosus. Scutellum parte apicali retrorsum angustata, frenis ultra medium scutelli continuatis. Carina mesosternalis mediocris, nec lata nec sulcata. Venter spina basali longa compressa armatus, apud marem maculis sericeis haud instructus. Femora antica subtus apicem versus spina parva armata. Tibiæ anticæ vix dilatatæ. Membrana costis* 8 *instructa.*

There is no doubt that *Megarhaphis* is closely allied to Dallas's genus *Macrorhaphis*; but it seems to me that the characters pointed out above are of importance sufficient to necessitate the creation of a new genus for the species described below. The difference in the comparative proportions of the joints of the rostrum, the narrow and unfurrowed keel of the mesosternum, the absence of the two silky spots on the venter of the male, and other points will at once distinguish *Megarhaphis* from *Macrorhaphis*.

1. Megarhaphis wollastoni, sp. n.

M. *elongata, rufo-brunnea, rude et dense nigro-punctata; thoracis angulis lateralibus prominulis obtusiusculis; pedibus corpore concoloribus; antennis paullo pallidioribus; capitis lineis* 2 *longitudinalibus ocellos includentibus, marginibus tyli, vitta centrali capitis subtus sternique, maculis marginalibus dorsi abdominis, nebulisque ventris nigris; spina basali ventrali ad apicem testacea; membrana brunneo-fusca. Capitis lineis* 2 *longitudinalibus inter ocellos ad apicem currentibus, margine interiore orbitæ, tyloque, pronoti callis irregularibus prope marginem anticum, necnon carina longitudinali angusta, scutelli linea apicali longitudinali subelevata, corii spatiis irregularibus (una ad medium, altera prope apicem), haud vel vix punctatis; sterno ventreque minus dense*

punctatis, carina ventrali lævigata; scutello fovea parva sed profunda utrinque ad basin prope pronoti angulos posticos sat productos instructo.

♂. Long. 13, lat. 6 m. m.

Hab. "West Lodge" (exemplar unicum).

M. wollastoni agrees in many points of sculpture &c. with the description of *Macrorhaphis* (?) *acuta*, Dall. (List, i. 88. 2), from Congo, which species may perhaps pertain to the genus *Megarhaphis*.

2. NEZARA VIRIDULA, L.

Two examples without note of locality. This almost worldwide species is probably an introduction.

3. METACANTHUS CONCOLOR, sp. n.

M. *ochraceus; antennarum articulo* 1° *annulis, uno prope basin, altero sat lato ad apicem, articulo ultimo (apice excepto), rostro ad apicem, oculis, scutello (basi spinaque exceptis), femorum tibiarumque apicibus tarsisque necnon corii marginibus angustissime exteriore et interiore apicali plus minus piceis aut piceo-nigris; capitis vertice linea elevata longitudinali instructo; pronoti lobo antico rude punctato, sulco sat profundo inter lobos callis 3 irregularibus instructo, lobo posteriore postice valde elevato et longitudinaliter carinato; mesosterni spina laterali longissima, primum recta, deinde retro curvata.*

♂. Long. 5 m. m.

Hab. ad "The Barn," ubi *Aster glutinosus* (Roxb.) (anglice "Scrubwood") occurrit.

I have seen only one specimen.

4. NYSIUS SANCTÆ-HELENÆ, sp. n.

N. *oblongus, ochraceus, setulis brevibus concoloribus vestitus; antennis, rostro, capite, pronoti impressione lineari transversa anteriore, scutelli basi sternoque plus minus rufo-brunneis; antennis articulo* 4° *basi excepto, rostro ad apicem, capite vitta utrinque inter oculos, punctis pronoti maculisque utrinque ante marginem posticum, scutelli punctis, costis et maculis clavo disco-quecorii, hujus margine apicali plus minus interrupte, membrana maculis irregularibus, femoribus maculis, apice tarsorum, sterno ad medium, necnon maculis ventris nigris vel fusco-nigris. Bucculis basin capitis vix attingentibus, pone medium retrorsum sensim humilioribus; articulo* 1° *rostri pone bucculas extenso et basin capitis attingente; capite cum oculis quam apex pronoti latiore; antennarum articulo* 2° *quam* 3us *longiore; pronoto et scutello (illius basi excavata excepta) carina levissima instructis; mesosterno distincte sulcato; margine costali corii antice recto, dein rotundato-ampliato.*

♂ ♀. Long. $5\frac{1}{2}$–$6\frac{1}{2}$, lat. 2–$2\frac{1}{2}$ m. m.

Hab. in intermediis editioribusque insulæ—"Plantation," "West Lodge," "Luffkins," et ad "Diana's Peak."

Nysius sanctæ-helenæ varies considerably both in the number and intensity of the darker markings. Sometimes the whole of the clavus and disk of the corium are fuscous with pale spots, and the apical margin entirely infuscated; but the widened anterior margin of the corium is almost always immaculate, except that sometimes there is a dark streak near the apical margin.

This species belongs to the section *a a* of the genus *Nysius* in Stål's 'Enumeratio;' but it does not appear to be very closely allied to any of the species therein placed.

5. Nysius thymi, Wolff.

Hab. in intermediis editioribusque insulæ—"Plantation," "West Lodge," et ad "Diana's Peak."

I cannot find any points of distinction between British and St.-Helena specimens of this common and variable European species, except that the latter seem to be rather smaller and to have more slender antennæ and legs.

It does not appear to have been previously found out of Europe.

Hapa, gen. nov.

Corpus oblongo-ovatum, parce hirsutum. Caput sulca transversa curvata inter oculos anterius præditum, inter oculos latum, modice productum, collari mediocri instructum, pone oculos læve nitidumque. Antennæ pilosæ, articulo 1° *apicem capitis superante,* 2° *sursum leviter incrassato,* 3° 4°*que filiformibus. Rostrum medium mesosterni attingens, articulo* 1° *oculos attingente. Pronotum haud vel obsoletissimo collari instructum, transversum, apice truncato, basi levissime concava, angulis anticis rotundatis et maxime depressis, lateribus acutis; discus anterius convexo transverse rugosus, posterius depressus et leviter concavus ante angulos posticos, ad medium sulco longitudinali plus minus obsoleto instructus. Scutellum anguste transversum, ad basin convexum concavum ad marginem utrinque pone basin, apice leviter acuminato, disco leviter concavo et leviter longitudinaliter rugoso. Elytra macropterorum apicem abdominis paullo superantia et membrana obsolete* 3*-venosa. Elytra sæpius tantum dimidio abdominis æquilonga, membrana haud instructa. Femora antica maris reliquis crassiora; tibiæ anticæ apicem versus distincte incrassatæ, margine inferiore serie brevissimarum spinularum instructo; tibiæ posticæ spinis nonnullis setiformibus instructæ. Pedes feminæ graciliores, tibiis anticis haud incrassatis nec ut in* ♂ *formatis. Quartum et sequentia segmenta abdominis maris sinistrorsum asymmetrica, supra* 4°, 5° 6°*que abdominalibus et* 1° *genitali segmentis sinistrorsum maxime abbreviatis; segmento* 1° *genitali fere contecto ad marginem sinistrum; segmento genitali ultimo (ut videtur) triangulari, levitur sinistrorsum contorto, latere sinistro foramine calloso-marginato (quod fere æquilongum est ac segmentum), instructo. Quarti segmenti abdominis subtus margo posticus ad latus sinistrum profunde sinuatum. Abdomen feminæ symmetricum. Apex abdominis* ♂ *et* ♀ *pilis nonnullis longis apicem versus instructus.*

Genus *Piezostetho* affine.

Nomen a Maori "hapa" (contortus).

Obs. In *Piezostethus*, to which the genus is allied, the males have also unsymmetrical hind bodies—a fact, by the way, that I do not see noticed in any of my books.

6. HAPA CONTORTA, sp. n. (Plate XXXI. fig. 1.)

H. *piceo-nigra, pilis brunneis vestita; capitis apice, antennis, pronoti margine postico, elytris, pedibus abdomineque plus minus piceo-brunneis; rostro, antennarum articulis duobus ultimis, cuneo ad basin, trochanteribus, femoribus ad basin, tibiis ad basin apicemque et tarsis plus minus dilutioribus; abdomine obscuriore variegato. Macropterorum clavi disco, corii margine antico basin versus, et macula ad medium basale membranæ paullo dilutioribus; membrana fusco-luteo-brunnea, venis obscurioribus.*

♂ ♀. Long. 3–3½, lat. 1½ m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

I have seen but a single macropterous specimen, and that rather mutilated.

7. CARDIASTETHUS BICOLOR, sp. n.

C. *niger, capillis pallidissime brunneis vestitus; antennis, rostri apice, elytris pedibusque luteo-brunneis; capite nitido rufo-brunneo, clypeo dilutiore; rostro (apice excepto), antennarum articulis 2 ultimis, elytrorum suturis, margine interiore lato embolii, margine interiore discoque cunei plus minus fusco-brunneis; membrana luteo-fusca. Capite lævi; clypeo sat angusto; pronoto (callo excepto), scutello elytrisque subtiliter punctatis.*

Long. circa 2½ m. m.

Hab. in intermediis insulæ—"Plantation."

Rather closely allied to *C. testaceus*; but, besides differing in colour, *C. bicolor* is a narrower and more slender insect.

9. MYRMEDOBIA FULIGINEA, sp. n.

M. *atra; antennis piceis, articulo 1° dilutiore ad basin, articulo 2° ad basin medium apicemque albido, articulo ultimo ad apicem rufo-piceo; pedibus piceo-nigris, femoribus posticis ad apicem, annulis 2 ad medium tibiarum anticarum intermediarumque, et dimidio basali tarsorum omnium albidis; capite convexo; antennis subtiliter pubescentibus, articulis 2° 3°que subæquilongis; pronoto maxime convexo, annulo male definito, sulco transverso, nullo; elytris margine antico anguste reflexo.*

♀. Long. 1 m. m.

Hab. locos editiores supra "West Lodge."

10. CALOCORIS (MEGACŒLUM) LUSTRATUS, sp. n.

C. *sordide stramineo-testaceus, maculis parvis fuscis rufisque remote et obscure notatus, capillis tenuibus adpressis pallido-aureis vestitus; pronoto obsoletissime punctulato; oculis, maculis parvis*

in disco et ante marginem posticum pronoti, macula geminata ad basin scutelli, dimidioque apicali femorum posticorum plus minus brunneo- vel rufo-fuscis ; apicibus rostri scutellique fusco-nigris ; antennarum articulo 3° ad apicem et articulo 4° toto, apice imo tibiarum anticarum, apicibusque tarsorum omnium pallide fusco-brunneis ; capite, antennarum articulo 1°, dimidio apicali femorum anticorum intermediorumque, tibiis omnibus ad basin, et interdum elytris et lateribus abdominis supra subtusque, sat conferte rufo-sparsis.

♂ ♀. Long. 6, lat. 2 m. m.

Hab. in intermediis insulæ—"Plantation."

Sometimes the apical half of the antennæ is vinous-red in colour and the fuscous markings generally more suffused with red.

11. ORTHOTYLUS MUTABILIS, sp. n.

O. *pallide fusco-brunneus, capillis pallidis vestitus ; pronoti margine postico elytrorumque margine exteriore anguste fusco-nigris ; elytris lutescenti- vel viridescenti-fuscis ; antennis pedibusque rufo-fuscis, illarum articulis 1° ad basin, 2° ad apicem, 3° 4°que, necnon tarsorum articulo ultimo et interdum tibiis ad basin, obscurioribus ; rostro ochraceo, apice fusco-nigro ; membrana pallide fusca venis dilutioribus. Sat angustus, elongatus ; antennis $\frac{4}{5}$ corporis æquilongis, articulo 3° plus dimidio 2^1 longiore, 4° $\frac{1}{2}$ 3^1 subæquilongo ; rostro coxas posticas haud superante ; pronoti lateribus vix sinuatis, callis parvis ; scutello convexo, ante medium transverse depresso.*

♂ ♀. Long. 4 m. m.

Hab. editioribus insulæ—"West Lodge" et "Diana's Peak."

Very variable in the intensity of the coloration. It is allied, but not very closely, to *O. nassatus*, and belongs to the same group of the genus.

12. LYGUS APICALIS, Mey., Fieb.

Hab. in intermediis insulæ—"Plantation."

A South-European species, probably introduced into St. Helena.

AGRAMETRA, gen. nov.

Corpus oblongo-ovatum, sat rude punctatum, nudum. Caput nutans, latum, convexum ; clypeo modice producto, compresso, a fronte parum discreto ; vertice immarginato ; gula brevi. Oculi oblongi, leviter granulati, pronoto contigui. Antennæ sat crassæ, ad oculorum medium internum insertæ, corporis dimidio subæquilongæ, articulo 1° crasso apicem clypei longe superante. Rostrum coxas posticas vix attingens, articulo 1° capitis basin vix superante. Pronotum trapeziforme, convexum, latitudine apicali vix longius, basi quam apice $\frac{1}{3}$ latius, apice, lateribus et basi ante scutellum leviter sinuatis. Scutellum ad basin detectum. Hemelytra completa, corii margine exteriore ad basin subito dilatato-explanato ; clavo, corio cuneoque coriaceis ; membrana biareolata. Alæ hamo instructæ. Pedes sat breves ; femoribus sat incrassatis ; tibiis

modice fusco-spinulosis sed haud punctatis; tarsis posticis longioribus, articulo ultimo duobus primis simul sumptis paullo breviore.

Generibus *Plagiognatho* et *Sthenaro* subaffinis.

13. AGRAMETRA ÆTHIOPS, sp. n. (Plate XXXI. fig. 2.)

A. *piceo-nigra nitida; rostro (apice excepto), coxis, femoribus, tarsorumque articulo ultimo piceo-brunneis; antennis, tibiis, tarsorumque articulis duobus primis sordide ochraceis; antennarum articulo* 1° *ima basi, articulo* 2° *ad apicem,* 3° 4°*que piceo-nigris, imis apicibus* 2^{i} 4^{i}*que dilutioribus; membrana fusca, venis parvæ cellulæ exterioris rufis; antennis, pedibus abdomineque capillis tenuibus pallide fuscis vestitis; antennarum articulo* 1° *paullo supra basin subito incrassato, valido, cylindrico;* 2° *sursum sensim incrassato, quam pronoti basis breviore,* 3° 4°*que fusiformibus,* 3° $\frac{1}{4}$ 2^{i} *paullo longiore,* 4° $\frac{2}{3}$ 3^{i} *subæquilongo.*

♂ ♀. Long. $3\frac{1}{2}$ m. m.

Hab. in regione *Commidendri robusti* DC. (anglice "Gumwood") —"Luffkins" et "Thompson's Wood."

14. PSALLUS FLAVOSPARSUS, sp. n.

P. *testaceus, capillis pallidissime aureis vestitus, capite thoraceque præterea pilis nigris validioribus instructis; capite, pronoto scutelloque ad basin fusco-atris indistincte nigro-guttulosis et maculis flavidis (una ad marginem interiorem oculi, una utrinque pone marginem anticam et altera in disco pronoti, necnon una distinctiore in angulis anticis scutelli) ornatis; angulis imis posticis pronoti testaceis; scutello ad apicem clavoque flavo-guttulosis, corio cuneoque flavo- et fusco-sparsis, macula orbiculari prope apicem clavi et macula irregulari oblonga ante mediam basin cunei fusco-nigris; membrana dilute fusca, iridescente, basi et fascia angusta transversa pone albidas venas dilutioribus; antennis testaceis, annulo prope basin et macula ad interiorem articuli* 1^{i}, *annulis basali apicalique* 2^{i}, 3° 4°*que fusco-nigris; femoribus anticis et intermediis ad apicem, margine apicali antico femorum posticorum, necnon tibiis omnibus e punctis nigris nigro-spinulosis; articulo ultimo tarsorum fusco; antennis mutilatis, sed, ut videtur, articulis* 3° 4°*que simul sumptis saltem* 2° *æquilongis.*

♀. Long. 3 m. m.

Hab. in regione *Commidendri robusti* DC. (anglice "Gumwood") —"Thompson's Wood."

15. PSALLUS LUTOSUS, sp. n.

P. *Sat robustus, testaceus, opacus, aureo-pubescens, rufescenti-brunneo dense irroratus; signaturis obscuris plus minus confluentibus, præsertim in parte antica pronoti, medio apiceque scutelli, apicibus clavi coriique necnon femoribus; antennis rufo-brunneis, articulo* 1° *ad apicem testaceo, articulo* 2° *ad basin apicemque et articulis duobus ultimis fusco-brunneis; tibiis testaceis, annulis*

plurimis angustis rufescenti-brunneis notatis et e punctis nigris nigro-spinulosis; membrana fusca pallide transverso-fasciata, venis albidis. Antennarum articulis 2 ultimis simul sumptis 2° brevioribus, 4° ½ 3¹ subæquilongo.

Long. 4, lat. 2 m. m.

Hab. in regione *Commidendri robusti* DC., ad "Peak Gut."

16. PSALLUS VINACEUS, sp. n.

P. *gracilis, obscure vinaceus, nitidus, capillis pallidis sublongis vestitus; antennarum articulo 1° et 2° ad apicem, rostro, scutello ad apicem, clavi disco, guttulis in disco corii, sutura inter corium cuneumque, cuneo ad apicem, femoribus ad apicem, tibiis tarsisque plus minus testaceis vel vinaceo-testaceis; clavi parte pallida, femoribus posticis ad apicem et tibiis posticis plus minus vinaceo maculatis; apicibus rostri tarsorumque necnon membrana fuscis, hac basi et fascia transversa pone cellulas dilutioribus, venis albidis, venis cellulæ exterioris interdum rufis; tibiis e punctis nigris nigro-spinulosis. Antennarum articulis 2 ultimis simul sumptis 2° æquilongis, 4° quam dimidium 3¹ breviore.*

♂ ♀. Long. 3–3½, lat. 1¾ m. m.

Hab. in editioribus insulæ, ad "Diana's Peak."

Very like a small dark form of *Psallus lutosus*, but distinguished by its slenderer and more shining form, longer and less golden pubescence, more slender legs and antennæ, the more uniform darker markings, and more convex pronotum with less concave hind margin.

17. NABIS CAPSIFORMIS, Germ.

Hab. in intermediis insulæ, ad "Plantation."

An African and American species, possibly (probably?) introduced.

VERNONIA, gen. nov.

Corpus elongatum. Caput ante oculos oblongo-productum, parte anteoculari parti postoculari subæquali; clypeo distinctissime convexo-elevato, angusto, jugis depresso-rotundatis, medium versus constrictis, ad apicem leviter incrassatis. Oculi sat magni. Ocelli desunt. Rostrum 4-articulatum, coxas posticas attingens, gracile, articulo 1° brevi, duplo longiore quam latiore, 2° 3°que longis, subæqualibus. Antennæ setaceæ, gracillimæ, corpore ¼ longiores, articulo 1° quam caput ¼ longiore, 2° quam primus ¼ longiore, 3° 2° æquilongo, 4° brevissimo. Pronoti lobus anticus lobo postico angustior; lobus posticus lateribus subparallelis obtuse et callose marginatis instructus, ante marginem posticum truncatum leviter transverse sulcatus. Scutellum latius quam longius, ad basin transverse modice elevatum. Elytra abbreviata, scutello tantum duplo longiora, ad apicem rotundata, coriacea, marginata. Acetabula antica postice aperta, a basi prostethii excisa; mesosternum carina, pone medium distinctissima, instructum; orificia subobscura ante coxas posticas sita. Pedes gracillimi et longissimi; coxæ longiusculæ; tibiæ anticæ seriebus duabus, tibiæ

intermediæ serie unica, dentium nigrorum tenuissimorum instructæ; femora antica modice incrassata, deorsum sensim angustata, tibiis paullo longiora; tibiæ omnes ad apicem leviter incrassatæ; pedes postici longissimi; femora postica ad apicem modice incrassata; tarsi omnes sat longi, articulo 1° *brevissimo, duobus ultimis subæquilongis. Abdomen elongato-ovale, connexivo dilatato ad segmenta* 3um 4um*que latissimo, illinc apicem basinque versus sensim angustato.*

Genus *Arbelæ* affine, memoriæ viri celeberrimi beati Thomas Vernon Wollaston dicatum.

18. VERNONIA WOLLASTONIANA, sp. n. (Plate XXXI. fig. 3.)

V. *rufo-brunnea* (♂) *vel rufo-lutea* (♀) *rufo-sanguineo variegata; capitis parte anteoculari, antennis pedibusque pilis brevibus pallide brunneis vestitis; antennarum articulo* 1° *rufescente annulis latis obscurioribus, ad apicem basinque distinctioribus, ornato; articulo* 2° *flavescente annulis* 5 *vel* 6 *fuscis, quarum* 3 *in dimidio basali et ad apicem distinctiores sunt, instructo,* 3° 4°*que fusco-brunneis obscure annulatis; pedibus plus minus distincte fusco vel rufo fusco-annulatis, ad basin testaceis; abdomine supra sanguineo-variegata, subtus testacea vitta angusta centrali et vitta latiore laterali utrinque ornata; abdominis segmento* 6° *ad medium supra subtusque sinuato.*

♂ *Segmento genitali quadrato, ad apicem truncato.*

♂ ♀. Long. 10–12, lat. pronoti $1\frac{1}{2}$–$1\frac{3}{4}$; abdominis ♂ $2\frac{1}{2}$, ♀ 4 m. m.

Habitat in excelsioribus centralibus insulæ, inter *Compositas* arborescentes.

19. SALDA ABERRANS, sp. n. (Plate XXXI. fig. 4.)

S. *obovata, atra, opaca, pilis brevibus erectis nigris, aliis depressis aureis intermixtis, vestita; antennarum articulo basilari (apice excepto), clypeo nitido, rostro, callo utrinque ad medium interne oculorum, pronoti marginibus lateralibus anguste, marginibus exterioribus interioribusque (illo basin versus latiore dilutioreque) elytrorum, necnon maculis nonnullis irregularibus corii pedumque brunneis vel pallide piceo-brunneis; clavi maculis triangularibus, una pone medium, duabus prope apicem, linea ante medium suturæ clavalis, corii maculis* 5 *prope marginem anticum et nonnullis in disco albidis; tibiis ad apicem anguste pallidis, apice imo et articulo ultimo tarsorum piceo-nigris; unguiculis piceo-brunneis. Late obovata, pone medium latior; capite cum oculis quam pronoti apex latiore; vertice ante ocellos foveolato, margine antico subobtuse incrassato; antennis vix incrassatis; rostro longo, coxas posticas attingente; pronoti margine postico quam margo anticus duplo latiore, marginibus lateralibus anguste reflexis; callo antico magno, sulco profundo longitudinaliter diviso, pone callum sulco angusto profundo fovea obliqua ad angulum posticum currente utrinque conjuncto; scutello convexo, ad medium semicirculariter transverse sulcato; elytris totis coriaceis convexis, margine antico rotundato*

et reflexo præcipue ad basin, margine interiore pone apicem scutelli recto, margini elytri alterius haud incumbente; (membrana alæque desunt;) pedibus modicis, tibiis ad apicem subincrassatis; tarsorum articulo 1° *brevi, articulo ultimo longissimo.*

♂ ♀. Long 3–5, lat. (pone medium) 2–3 m. m.

Hab. in editioribus insulæ, juxta "Diana's Peak."

The absence of the membrane prevents me referring this to any of the sections given by Dr. Stål in his 'Enumeratio.' It may perhaps belong to a new genus; but as it has all the facies of a *Salda*, I have placed it in that genus.

S. aberrans is very variable in the intensity of the brown markings. Frequently the corium is more or less of a rich fulvous brown with anastomosing black lines; the whitish spots also vary in intensity. There is, moreover, a considerable range of variation in the size of the animal.

20. Issus coleoptratus, F.

Hab. intermedis insulæ, ad "Plantation."

A common European species, and doubtless introduced into St. Helena.

Liburnia, Stål.

Ilburnia, subgen. nov.

Antennarum articulus primus articulo secundo æquilongus vel paullo longior. Tibia postica tarso postico parte quarta longior.

21. Liburnia (Ilburnia) ignobilis, sp. n.

L. *testaceo-brunnea; fronte distincte, clypeo, pronoto scutelloque obsolete (carinis exceptis), sterni maculis nonnullis abdomineque plus minus brunneis; dorso abdominis utrinque vitta longitudinali pallida, in segmentis* 1° *ad apicem,* 2° *et* 3° *ad basin distinctiore, et in segmentis* 1°, 4°, 5°, 6°*que interne magis, externe minus brunneo-marginata; connexivo brunneo, angulis exterioribus apicalibus pallidis; tarsorum unguiculis piceo-nigris; elytris subhyalinis, concoloribus, vix dimidium abdominis tegentibus; oculis subrufis; capite desuper viso et pronoto longitudine subæqualibus, illo inter oculos breviter prominulo, vertice singulo oculo subæquilato; carinis omnibus discretis; fronte longa, deorsum dilatata, carina centrali ad verticem brevissime furcata; clypei carina centrali obsoleta; pronoto scutelloque distinctissime carinatis, illius carinis lateralibus obliquis rectis marginem posticum attingentibus; alis abbreviatis.*

♀. Long. 5, lat. 2 m. m.

Habitat in excelsioribus insulæ, ad "Diana's Peak."

Ilburnia diverges from the characters of *Liburnia* by the longer first joint of the antennæ, and the shorter hind tarsus. In the collection are two other Homoptera belonging to this family: one, which is much broken, is perhaps the ♂ of the above; and the other seems to be an immature *Stiroma*?

STONASLA, gen. nov.

Corpus cylindricum, elongatum. Caput obtusissimum, latum, thoraci æquilatum seu paullo latius, desuper visum brevissimum, subangulato-arcuatum, vertice maximam ad partem declivi; facie dilatata, transversa, fere subquadrata; apice obtusissime angulato; marginibus lateralibus ante oculos distinctissime sinuatis, dein valde rotundato-dilatatis; plica supraantennali valde obliqua, oculos haud attingente. Ocelli inter oculos in parte antrorsum vergente verticis positi, ab oculis remoti, sed inter se quam ab oculis longius distantes. Pronotum transversum, sat longum, antice subangulato-rotundatum. Scutellum mediocre, latius quam longius. Elytra alæque apicem abdominis longe superantia. Elytra pone clavum angustissime marginata. Venæ elytrorum alarumque fere ut in Bythoscopo *formatæ; membranæ cellulæ apicales* 4. *Alæ ante apicem emarginatæ. Tibiæ posticæ spinosissimæ.*

Genus *Bythoscopo* affine, forma faciei &c. divergens. [Typus *S. undulata*.]

22. STONASLA UNDULATA, sp. n. (Plate XXXI. fig. 5.)

St. *sordide virescenti-flavescens, subopaca; capitis macula parva irregulari inter oculos et ocellos (necnon interdum macula inter ocellos, maculaque utrinque in margine postico pone ocellos), fovea utrinque ante antennas, parte antica suturæ frontalis, et basi (media et lateribus prope basin clypei exceptis), pronoti macula parva utrinque ad marginem anticum, scutelli basi centrali anguste, macula triangulari utrinque prope angulos basales, maculis parvis rotundis in disco, sulco transversali ad medium angustissime, necnon apice imo, elytrorum venarum punctis irregularibus subconfluentibus et lineis dentato-fractis inter venas (membranæ exceptis), alarum venis, sterno (lateribus exceptis), macula ad apicem superiorem femorum omnium, tibiarum posticarum margine exteriore superiore, unguiculisque necnon abdomine brunneo-nigris; oculis, ocellis, frontis serie linearum irregularium transversarum utrinque, femorum maculis irregularibus, et tarsis anticis intermediisque plus minus brunneis; alis infuscatis. Elytris oblongo-lanceolatis.*

♂ ♀. Long. 8–9½, lat. 3–3½ m. m.

Hab. in editioribus insulæ, ad "Cason's."

23. STONASLA CONSORS, sp. n.

St. *testaceo-brunnea, opaca, elytra subopaca; capitis macula rotunda pone ocellos et prope marginem posticum, fovea ante antennas, frontis sutura antice, basi (media excepta) et lateribus prope basin clypei, necnon serie utrinque lineolarum transversarum, pronoti linea longitudinali centrali nec apicem nec basin attingente, macula parva utrinque prope marginem anticum et macula majore utrinque in disco, scutellim acula parva ad mediam basim et macula triangulari prope angulos basales necnon sulco transverso angustissime, clavi venis irregulariter, corii venis distincte, femorum intermediorum posticorumque macula superiore apicali, unguiculis*

et abdomine subtus brunneo-nigris; scutelli dimidio apicali testaceo-flavido; oculis ocellisque brunneis.

♂ ♀. Long. 7½–9, lat. 2½–3 m. m.

Hab. in editoribus insulæ, ad "Diana's Peak" et "Halley's Mount."

In addition to the differences of coloration, this species may be distinguished from the last by the internal sector of the elytra having three cells exteriorly between the base of the elytron and the apex of the clavus instead of two, as well as by the somewhat smaller stature.

NEHELA, gen. nov.

Corpus cylindricum, elongatum. Caput obtusissimum, latum, thoraci æquilatum, desuper visum brevissimum angulato-arcuatum; vertice magnam ad partem declivi; facie dilatata, subtriangulari, apice producto, lateribus ante oculos late sinuatis, dein leviter rotundatis; plica supraantennali valde obliqua, oculos fere attingente. Ocelli inter oculos in parte antrorsum vergente verticis positi, ab oculis et inter se fere æquidistantes. Clypeus distincte productus, sulco inter basin et frontis apicem haud instructus. Pronotum transversum, sat longum, antice subangulato-rotundatum. Scutellum mediocre, latius quam longius. Elytra apicem abdominis superantia, pone clavum anguste marginata. Elytrorum alarumque venæ ut in Stonasla *formatæ. Tibiæ posticæ spinosissimæ.*

Genus *Stonaslæ* valde affine, forma faciei, situ ocellorum, et clypeo distinctius producto divergens.

24. NEHELA VULTURINA, sp. n. (Plate XXXI. fig. 6.)

N. atra, opaca; capitis vertice (maculis parvis 2 ad ocellos et 4 ad marginem posticum exceptis), oculis, macula triangulari in medio frontis, antennis et lateribus, pronoti marginibus lateralibus interne angulatis, margine postico et maculis 2 parvis in disco (interdum obsoletis), scutelli macula utrinque ad marginem ante apicem, elytrorum (clavo excepto) lineolis longitudinalibus latis inter venas, necnon marginibus antico interioreque corii, pedibus anticis intermediisque (unguiculis exceptis), coxis posticis, femoribus posticis ad apicem, tibiarum posticarum basi spinisque et articulis 2 primis tarsorum posticorum testaceo-brunneis.

♂ ♀. Long. 7–7½, lat. 2–2½ m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak" et "High Peak."

Frequently the veins of the clavus are more or less brown; and more rarely the whole of the elytra is entirely black.

ARGATERMA, gen. nov.

Corpus oblongum, paullo depressum. Caput breve, pronoto paullo breviore et latiore, margine antico acuto; vertice inter oculos quam singulus oculus duplo latiore, horizontali, concavo præsertim antice, margine antico arcuato, acuto, inter ocellos angustissime reflexo. Ocelli in margine antico prope oculos positi. Facies convexa, dilatata, subquadrata, apice obtusissime rotundato, lateribus ante oculos sinuatis, dein leviter rotundatis; sutura frontali ocellos attingente. Pronotum transversum, antice arcuatum, inter oculos

prominulum, postice truncatum. Scutellum transversum, latius quam longius. Elytra subcoriacea, tectiformia, oblonga, apicem abdominis vix superantia, areis pluribus subquadratis instructa. Alæ areis apicalibus 4 *instructæ, venis in venam peripheram terminantibus, marginem haud attingentibus. Pedes mediocres, femoribus posticis paullo compressis, tibiis posticis spinosissimis, tarsis posticis articulo* 1° *articulis* 2° *una cum* 3° *æquilongo, articulo* 2° *quam* 3us *breviore.*

Genus *Sivæ* et *Selenocephalo* affine. [Typus *A. alticola.*]

25. ARGATERMA ALTICOLA, sp. n. (Plate XXXI. fig. 7.)

♂ *læte fulvus, nitidus; verticis limbis, pronoti vitta centrali longitudinali et limbo postico, scutelli apice imo, clavi marginibus interne erosis, et fascia ante medium, corii marginibus (exteriore ad basin excepto), fascia ante medium et maculis pone medium, necnon areis apicalibus albidis; verticis marginibus imis antico posticoque, macula utrinque ad oculos posterius, maculis* 4 *ad marginem anticum* (2 *intermediis geminatis,* 1 *lunata utrinque pone ocellos*), *facie, pronoti maculis parvis* 5 *ad marginem posticum, sterno ad medium, corii marginibus macularum albidarum pone medium et arearum apicalium nigris; abdominis dorso nigro, segmentis* 4°, 5° 6°*que et ventre, necnon segmentis genitalibus et pedibus brunneo-testaceis; oculis, alis, tibiarum posticarum margine postico, maculis marginis antici apiceque, tarsorum posticorum articulorum apicibus, necnon unguiculis omnibus nigro-brunneis.*

♀ *læte fulva, verticis limbo antico, pronoti limbo postico, scutelli apice imo, elytrorum areis apicalibus flavescenti-albidis; verticis marginibus imis antico posticoque, macula utrinque ad oculos posterius, maculis* 2 *in disco, et* 4 *ad marginem anticum* (2 *intermediis interdum postice conjunctis,* 1 *lunata utrinque pone ocellos*), *pronoti maculis* 5 *ad marginem posticum, elytrorum arearum plurium parvarum subquadratarum, areolarum elongatarum pone medium, necnon arearum apicalium marginibus nigris; cetera ut in* ♂.

♂ ♀. Long. $3\frac{1}{2}$–5, lat. $1\frac{1}{2}$–2 m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

I have seen but one ♂; and it is possibly a variety. The elytra of the ♀ have numerous black-margined cells or cell-like spots more or less variable. On the clavus and corium, to beyond the middle, these are small and vary in size, but are more or less square. Between these and the apical cells there is a transverse row of 4, more elongate, cells, of which one or more are sometimes subdivided. Beyond these are 5 marginal cells at the apex of the elytron. The veins of the elytron are scarcely distinguishable.

26. ARGATERMA MULTISIGNATA, sp. n.

A. *fulva, nitida; verticis limbo antico, pronoti margine imo postico, elytrorum areis apicalibus flavescenti-albidis; verticis marginibus imis antico posticoque, macula utrinque posterius ad oculos, maculis* 2 *in disco,* 3 *ad marginem anticum* (1 *in medio interdum fissa,* 1

utrinque pone ocellos), pronoti margine antico maculis 7, 3 *intermediis elongatis magnis transversis in fasciam sæpe confluentibus, disco fascia transversa abbreviata, limbo postico, necnon macula parva utrinque ad angulos laterales, scutelli macula elongata utrinque ad basin, elytrorum maculis plurimis subquadratis areiformibus, sterno abdomineque nigris; sterni lateribus, abdominis segmentis* 6° *et genitalibus (his nigro-signatis) pedibusque brunneotestaceis; femoribus anticis et intermediis supra, posticis totis (basi apiceque exceptis), tibiis posticis magnam ad partem, tarsis anticis et intermediis ad apicem, posticorum apicibus articulorum omnium, unguiculis oculisque nigro-brunneis; alis nigro-fuscis nigro-venosis; elytris areis apicalibus marginalibus nigro-marginatis* 6 *instructis.*

♂ ♀. Long. 3–4½, lat. 1½–2 m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

In stature and general colouring rather like the preceding, but distinguished at first sight by the much more numerous markings. Vertex more obtusely rounded in front and less prominent. Elytra with the veins scarcely distinguishable, covered with many somewhat square-shaped cell-like black markings, arranged in longitudinal rows. Apex of the elytron with six marginal cells, of which the first and the last are the largest. Venation of the wing different from what it is in *A. alticola*. There are four apical cells bounded by a peripherical vein as in that species; but the second cell (counting the apical as the first) is pedunculate, the peduncle joining the first and second sectors; and at the base of the fourth cell is a smaller cell formed by a transverse vein cutting off the base of the fourth cell. The venation is otherwise normal, but rather subject to variation. The elytra have sometimes obscure pale markings on the inner margin of the clavus, and vary also in the intensity of the black markings of the pronotum and scutellum.

27. GRYPOTES (?) INSULARIS, sp. n.

G. *aurantio-flavescens, nitidus; verticis macula subquadrata utrinque anterius et macula posterius prope oculos, frontis lineolis transversis in medio interruptis, clypei vitta centrali ad apicem dilatata, lororum marginibus, linea ante et macula pone antennas, maculaque ante oculos brunneis vel pallide brunneis; vertice utrinque linea obliqua brevi, pedibus maculis nonnullis, abdominis dorso, et corpore subtus maculis paucis nigris; scutello, abdominis dorsi lateribus, et corpore subtus flavescentibus; elytrorum margine antico late et venis, necnon valvulis genitalibus flavescenti-albidis; membrana dilutissime fusca.*

♂ ♀. Long. 5 m. m.

Hab. in editioribus insulæ, ad "West Lodge."

Perhaps scarcely correctly placed in *Grypotes*. Head, seen from above, angularly rounded and prominent between the eyes; as long as the hind margin between the eyes; broadly concave and with a fine impressed middle line; ocelli near the eyes; face very convex, and clypeus produced but scarcely curved; pronotum a little broader than

the head. There are sometimes additional brown markings on the vertex or face; and the spots on the legs are also occasionally confluent.

28. THAMNOTETTIX SANCTÆ-HELENÆ, sp. n.

T. *pallide aurantiacus, nitidus; capitis maculis* 2 *parvis obsoletis inter oculos, frontis lineolis obsoletissimis transversis, pronoti margine postico, scutelli angulis basalibus, clavi nebulis* 2 *male definitis* (1 *ante*, 1 *pone medium*), *corii nebulis* 3 (1 *ante*, 1 *pone medium*) *alteraque ad basin membranæ indistincte dilutioribus; corpore subtus abdomineque supra et subtus flavescentibus; tibiis posticis maculis nonnullis et unguiculis omnibus nigris.*

♂ ♀. Long. 5 m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

The always ill-defined pale markings are sometimes scarcely perceptible. The head, seen from above, is prominent and obtusely angularly rounded between the eyes; the face is very convex, and the pronotum broader than the head.

29. JASSUS WOLLASTONI, sp. n.

J. *flavescenti-albidus; verticis vitta transversa inter oculos, frontis vittis* 2 *latis longitudinalibus, clypei dimidio apicali saltem et macula utrinque ante oculos, pronoto* (*marginibus postico et lateralibus exceptis*), *sterni maculis ad latera, scutelli macula quadrata ad medium basale, clavi vitta ad suturam clavalem et vitta centrali a basi ad medium, corii vitta subundulata a medio ad membranam currente, lineis longitudinalibus* 2 *minoribus* (1 *inter vittam centralem et basin elytri*, 1 *inter vittam centralem et apicem corii*), *margine antico toto corii, tibiis anticis intermediisque et tarsis omnibus aurantiacis vel pallide aurantiacis; clavi linea juxta apicem marginis antici, membranæ margine basali, sterni maculis nonnullis ad medium, abdomine* (*marginibus segmentorum exceptis*) *nigrescentibus; membrana, alis fere totis, unguiculisque fuscis vel brunneo-fuscis; venis ad apicem corii membranæque pallide flavidis, venis ceteris obsoletis; capite pronoto fere æquilongo, rotundato et levissime prominulo inter oculos; verticis margine postico quam singulus oculus paullo latiore; vertice leviter dilatato antrorsum, foveola parva utrinque instructo; fronte haud carinata; marginibus oculorum desuper visorum divergentibus; ocellis prope oculos sitis; elytris oblongis.*

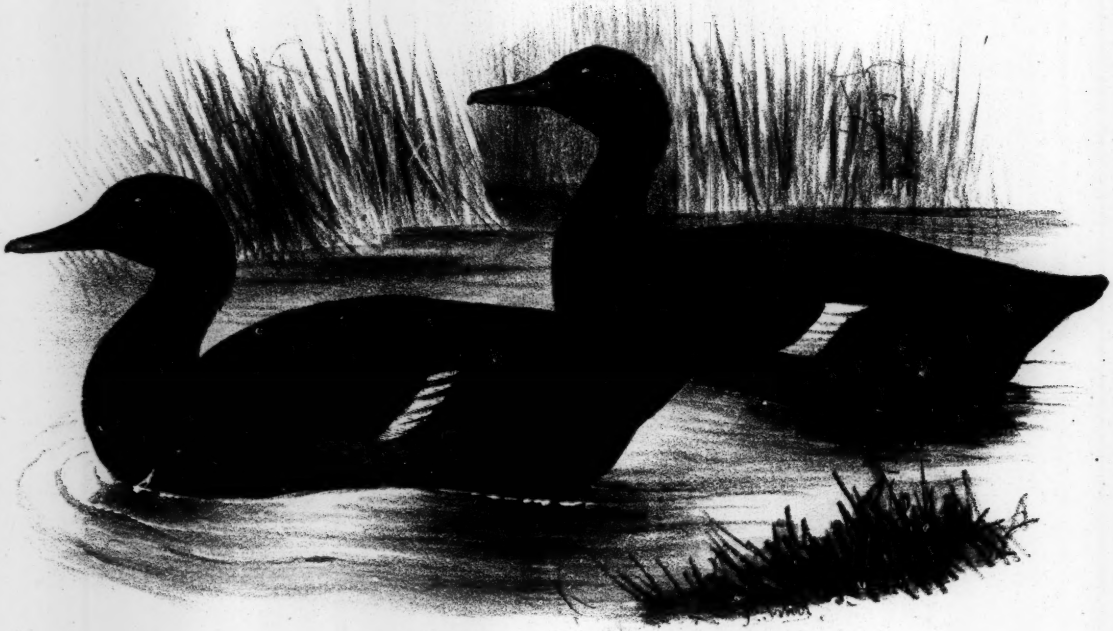
♂ ♀. Long 6, lat. 2 m. m.

Hab. in editioribus insulæ, ad "Cason's," "Diana's Peak," et "Vine-tree Gut."

Sometimes the clavus and inner margin of corium are infuscated, and the hind tibiæ have a row of black dots on the outside.

30. CHLORITA EDITHÆ, sp. n.

C. *pallide flavescenti-albida; verticis maculis* 2 *elongatis inter oculos, et pronoti maculis* 2 *in disco sanguineis; scutello* (*macula quadrata ad medium basale excepta*), *clavi linea ad marginem interiorem ab apice scutelli currente, corii margine interiore fere*



½

J.Smit.lith. FULIGULA ATRONI. Hanhart imp.

a basi ad apicem clavi, vitta dilutiore centrali inter apicem clavi et margine antico posita, et nebula ad marginem anticum apicem versus elytri læte aurantiacis; oculis, unguiculis et macula ad basin membranæ nigrescentibus; membrana pallide fusca, ad basin obscuriore, venis late pallide flavescenti-albidis, maculas 5 marginales (4 apicales) et 2 centrales cingentibus; femoribus tibiisque ad apicem flavescentibus; capite obtuse angulariter rotundato-prominulo inter oculos, longiore supra quam ad marginem posticum inter oculos; pronoto semicirculari, dimidio marginis postici æquilongo.

♂ ♀. Long. 3 m. m.

Hab. in editioribus insulæ, ad "Cason's," "High Peak," et "Diana's Peak."

Species venusta, in honorem Dominæ Edith Wollaston, quæ Lepidoptera et Coleoptera insulæ Sanctæ-Helenæ diligentissime collegit, dicata.

EXPLANATION OF PLATE XXXI.

Fig. 1. *Hapa contorta*, p. 466.
2. *Agrametra æthiops*, p. 468.
3. *Vernonia wollastoniana*, p. 470.
4. *Salda aberrans*, p. 470.
5. *Stonasla undulata*, p. 472.
6. *Nehela vulturina*, p. 473.
7. *Argaterma alticola*, p. 474.

3. Further Remarks on *Fuligula nationi*. By P. L. Sclater.

[Received April 12, 1878.]

(Plate XXXII.)

Professor Nation of Lima, Peru, has now forwarded to me a second specimen of the remarkable new *Fuligula* which Mr. Salvin and I described in the Society's 'Proceedings' last year (1877, p. 522), and dedicated to its discoverer. This is a male, the former example having been a female; but, as will be seen on comparison, there is not a great difference in plumage between the sexes. Prof. Nation says that this bird is rare in the neighbourhood of Lima, but that he has lately ascertained that it is common in the north of Peru, and is found in great numbers on the lakes near the coast in certain months of the year.

The species may now be diagnosed more correctly as follows:—

Fuligula nationi. (Plate XXXII.)

Fusco-atra fere unicolor, in ventre brunnescentior, hypochondriis et genis in brunneum transeuntibus; secundariorum parte basali, fasciam distinctam alarem constituente, alba; subalaribus nigris; remigum pagina inferiore obscure cinereacea; rostro et pedibus nigris: long. tota 18·0, *alæ* 8·5, *caudæ* 2·5, *tarsi* 1·45, *dig. med. cum ungue* 2·6, *rostri a rictu lin. dir.* 2·2. Femina *omnino brunnescentior, supra et in ventre tenuissime nigro vermiculata; capitis lateribus in brunnescenti-castaneum trahentibus; et crassitie minore.*

Hab. Peruvia occidentalis, prope Lima (*Nation*).

Fig. 1.

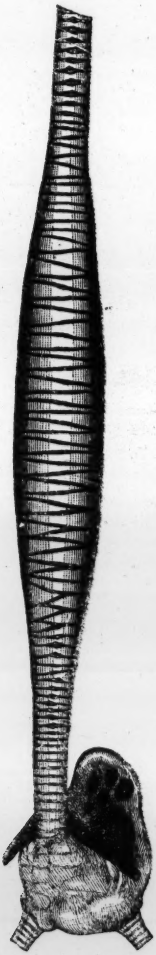
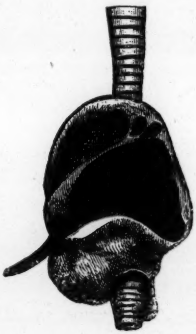


Fig. 2.



Trachea of *Fuligula nationi* ♂.

Fig. 1. Front view.
Fig. 2. Dilatation at its lower end, seen from the left side.

This species appears to be a true Fuliguline duck, the only known representative of the group in South America. In colour it is quite different from any other species of the genus known to me, being immediately recognizable by its black dress and the transverse white bar on the wing.

The characteristic Fuliguline white spot between the rami of the mandible is small in the male but quite distinct, larger in the female. The white colour in the secondaries occupies rather more than the basal two thirds, but does not extend onto the outer elongated feathers; it likewise pervades portions of both webs of some of the inmost primaries. The hinder toe has a well-developed lobe, almost as broad as in *F. collaris*.

Prof. Nation has also sent to me the dried trachea of the male specimen, for the preparation of a figure and description of which I am indebted to Prof. Garrod.

"In the trachea," Prof. Garrod remarks, "of this duck, as in the males of the sea-ducks generally, there is a large dilatation at the lower end, on the left side, composed of an osseous framework supporting membranous walls. The outer one of these is traversed by an intervening osseous bar (see fig. 2), which courses backwards and upwards from its anterior inferior angle, and sends two small extra bars to the supero-marginal rim, and so forms a pair of oval fontanelles, before it terminates at the superior and posterior angle of the outer wall.

"The wall of the tracheal box which faces inwards is ossified through nearly its entire extent, a few small membrane-covered fontanelles being found not far from its superior margin. In this respect the species differs from *Fuligula rufina*, in which the wall under consideration is almost entirely membranous, whilst it is almost identical with *F. marila*.

"The outer aspect of the terminal tracheal box is represented in fig. 2.

"Fig. 1 gives a front view of the trachea, which is seen to be considerably and fusiformly dilated in its middle part, in very much the same way as in *Fuligula rufina*, *F. marila*, *Nyroca leucophthalma*, *Clangula vulgaris*, and *Mergus serrator*[1], except that in the last-named species the enlargement is situated somewhat nearer the mouth.

"In *F. rufina* the dilatation of the middle of the trachea is rather more considerable and more localized to the lower portion of the windpipe, whilst in *F. marila* it is more extended and not quite so considerable in breadth. In fact *F. nationi* is almost exactly intermediate between the two, tending, if at all, towards the latter species.

"In the South-American *Metopiana peposaca* the mid-tracheal dilatation is much more decided and more limited, forming a nearly globose cavity[2] like that in *Melanitta fusca* and *Clangula histrionica*."

[1] Vide Eyton, 'Monograph of the Anatidæ,' 1838, p. 63.
[2] See P. Z. S. 1868, p. 146, and 1875, p. 154.

4. On a small Collection of Lepidoptera from Jamaica. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Received April 12, 1878.]

The Lepidoptera enumerated in the present paper were collected at or near Kingstown, Jamaica, by Mr. James John Bowrey, who has kindly permitted a selection to be made from them of all the species required for the national collection.

Among the Butterflies, as might have been expected, there is very little new, a species of *Pamphila* being the only one to which I have ventured to give a name; but among the more obscure and small Moths there are about two dozen novelties.

Rhopalocera.

1. Danais archippus, Fabricius, Ent. Syst. iii. 1, p. 49 (1793).

The males from Jamaica seem to possess a constant peculiarity in the immaculate black border of the secondaries.

2. Danais jamaicensis, Bates, Ent. Mo. Mag. i. p. 33 (1864).

3. Calisto zangis, Fabricius, Syst. Ent. p. 486 (1775).

4. Paphia portia, Fabricius, Syst. Ent. p. 507 (1775).

5. Aganisthos orion, Fabricius, Syst. Ent. p. 485 (1775).

6. Heterochroa abyla, Hewitson, Ann. Nat. Hist. ser. 2, vol. vi. pl. 9. fig. 7 (1850).

7. Eubagis egæa, Fabricius, Syst. Ent. p. 496 (1775).

8. Lucinia cadma, Drury, Ill. Ex. Ent. ii. pl. 18. figs. 1, 2 (1773).

9. Marpesia eleucha, Hübner, Samml. exot. Schm. ii. pl. 50 (1816–24).

10. Gynæcia dirce, Linnæus, Mus. Lud. Ulr. p. 287 (1764).

11. Anartia jatrophæ, Linnæus, Mus. Lud. Ulr. p. 289 (1764).

12. Junonia genoveva, Cramer, Pap. Exot. iv. pl. 290. figs. E, F (1782).

13. Cystineura dorcas, Fabricius, Syst. Ent. p. 508 (1775).

14. Phyciodes frisia, Poey, Cent. Lep. (1833?).

15. Eunica tatila, Herrich-Schäffer, Ausl. Schm. figs. 69–72 (1852–58).

In the examples from Jamaica the white spots are smaller than in the figure.

16. Euptoieta hegesia, Cramer, Pap. Exot. iii. pl. 209. figs. E, F (1782).

17. Dione vanillæ, Linnæus, Mus. Lud. Ulr. p. 306 (1764).

18. Colænis delila, Fabricius, Syst. Ent. p. 510 (1775).

19. Heliconius charithonia, Linnæus, Syst. Nat. i. 2, p. 757 (1766).

20. Lampides ceraunus, Fabricius, Ent. Syst. iii. 1, p. 303 (1793).

21. Tmolus columella, Fabricius, Ent. Syst. iii. 1, p. 282 (1793).

22. Tmolus pan, Drury, Ill. Ex. Ent. ii. pl. 23. figs 3, 4 (1773).

23. Nathalis iole, Boisduval, Sp. Gén. i. p. 589 (1836).

24. Terias gnathene, Boisduval, Sp. Gén. i. p. 680 (1836).

Mr. Bowrey has observed this species flying over low bushes. The flight of *Terias* is always very low.

25. Terias elathea, Cramer, Pap. Exot. ii. pl. 99. figs. C, D (1779).

26. Terias euterpe, Ménétriés, Bull. Mosc. p. 299 (1832).

27. Kricogonia terissa, Lucas, Rev. Zool. p. 429 (1852).

28. Kricogonia lyside, Godart, Enc. Méth. ix. p. 98 (1819).

29. Amynthia mærula, Fabricius, Syst. Ent. p. 479 (1775).

30. Callidryas sennæ, Linnæus, Syst. Nat. i. 2, p. 764 (1766).

Mr. Bowrey has seen vast clouds of this species passing over the town of Kingston, sometimes for a week at a time.

31. Appias poeyi, Butler, P. Z. S. p. 49 (1872).

32. Synchloë joppa, Boisduval, Sp. Gén. i. p. 495 (1836).

33. Papilio polydamas, Linnæus, Mus. Lud. Ulr. p. 192 (1764).

34. Papilio sinon, Fabricius, Syst. Ent. p. 452 (1775).

35. Papilio pelaus, Fabricius, Syst. Ent. p. 444 (1775).

36. Papilio homerus, Fabricius, Ent. Syst. iii. 1, p. 29 (1793).

37. Papilio cresphontes, Cramer, Pap. Exot. ii. pl. 165. fig. A, 166. fig. B (1779).

38. Papilio thersites, Fabricius, Syst. Ent. p. 453 (1775).

39. Goniurus proteus, Linnæus, Mus. Lud. Ulr. p. 333 (1764).

40. Goniurus catillus, Cramer, Pap. Exot. iii. pl. 260. figs. F, G (1782).

41. Telegonus, sp.? (Olive-brown, dull green at the base.)

This species is quite common in collections, and therefore is sure to have been described; but it would be necessary to work out nearly the whole family in order to identify it, many of the descriptions of *Hesperiidæ* being so bad that their determination is simply impossible.

42. Proteides amyntas, Fabricius, Syst. Ent. p. 533 (1775).

43. Pamphila ethlius, Cramer, Pap. Exot. iv. pl. 392, figs. A, B (1782).

44. Pamphila nyctelius, Latreille, Enc. Méth. ix. p. 746 (1823).

45. Pamphila phylus, Drury, Ill. Ex. Ent. i. pl. 13. figs. 4, 5 (1773).

46. Pamphila utha, Hewitson, Descr. Hesp. p. 37. n. 32 (1868).

The form from Jamaica being rather different from that of St. Domingo (and probably of Cuba), I append a description.

Wings above bright tawny, reddish at the base; a broad chocolate brown marginal belt from the end of the cell of each wing round the outer border to the external or anal angle, where the fringe becomes tawny; primaries with a large dark brown spot across the median vein; head and collar metallic green, bordered and crossed by testaceous lines of upright scales; remainder of the body above dull tawny, slightly olivaceous in front, yellowish below, with blackish spots down the centre of the venter. Primaries below with the disk of a yellower tint than above; the blackish median spot extended to the base, a blackish spot beyond the cell; outer border broadly brown, becoming ferruginous upon the costa: secondaries ferruginous, with a spot in the cell and a squamose angulated discal belt more or less orange; anal fringe bright orange. Expanse 2 inches.

I have to thank Mr. Du Cane Godman for the identification of this handsome species. I think it may be the insect intended by the description of *Eudamus capucinus*, Lefebvre; but the Latin of that description cannot be translated. It runs thus:—"E. *alis paululum subrotundatis, supra piceo-fuscis ad basin ochraceo-rubescentibus; anticis in mare supra arcu minuto subtus macula fere dubia, in disco luteis (fœminæ utrinque maculis duabus geminis eodem colore) nervula sectis; subtus anticis ad basin et disco inferiori nigris; omnibus alis fuscis atomis rubris griseisque omnino rubescentibus.*"

The whole of the descriptions of Lepidoptera in Ramon de la Sagra's 'Cuba' are of this character. *E. trinitad* is said to have three front wings on each side, with transparent unequal and yellowish spots, "*anticis utrinque tribus maculis translucidis inæquali-*

bus et flavescentibus;" and although in this case it is evident what is intended, in other cases it is not so[1]. Surely where a Latin diagnosis defies all possibility of translation it ought to be ignored.

47. PAMPHILA INSOLATA, n. sp.

♂. Primaries bronzy chocolate-brown, with tawny basal area; a large black patch below the cell, its anterior border embossed and greyish: secondaries tawny ochraceous; the costal area, outer border, and veins blackish: body greenish, abdomen dull tawny, palpi below sulphur-yellow; legs tawny. Wings below sordid ochraceous; primaries with the basal half of a brighter tint, the interno-basal area and a spot below the cell blackish; internal border dark greyish. Expanse 1 inch 8 lines.

Quite unlike any other species known to me.

48. PAMPHILA OTHO, Smith & Abbot, Lep. Ins. Georg. i. pl. 11 (1797).

49. ACHLYODES POTRILLO?, Lefebvre, Ramon de la Sagra's Cuba, p. 641 (1857).

The single example taken by Mr. Bowrey has only four hyaline apical dots on each of the primaries; but this may be what is intended by "anticis ad apicem 8 punctis translucentibus albis circulatim dispositis," the only difficulty being the arrangement of four dots so as to produce a circle.

HETEROCERA.

50. ENYO CAMERTUS, Cramer, Pap. Exot. iii. pl. 225. fig. A (1782).

51. CHÆROCAMPA CHIRON, Drury, Ill. Ex. Ent. i. pl. 26. fig. 3 (1770).

52. DEILEPHILA LINEATA, Fabricius, Ent. Syst. iii. p. 541 (1775).

53. PHILAMPELUS SATELLITIA, Linnæus, Mantissa, i. p. 539 (1771).

54. PACHYLIA FICUS, Linnæus, Mus. Lud. Ulr. p. 352 (1764).

55. AMBULYX STRIGILIS, Linnæus, Mantissa, i. p. 538 (1771).

56. AMPHONYX CLUENTIUS, Cramer, Pap. Exot. i. p. 124, pl. 78. fig. B (1779).

57. ANCERYX FASCIATA, Swainson, Zool. Ill. 2nd ser. vol. iii. pl. 150 (1823).

58. DILOPHONOTA ELLO, Linnæus, Mus. Lud. Ulr. p. 351 (1764).

[1] Examine the description of *Hesperia baracoa* as an example.

59. Dilophonota ænotrus, Cramer, Pap. Exot. iv. pl. 201. fig. C (1782).

60. Dilophonota omphaleæ, Boisduval, Lép. Guat. p. 72 (1870).

61. Protoparce rustica, Fabricius, Syst. Ent. p. 540 (1775).

62. Protoparce jamaicensis, Butler, Trans. Zool. Soc. ix. p. 608 (1876).

63. Protoparce cingulata, Fabricius, Syst. Ent. p. 545 (1775).

64. Pseudosphinx tetrio, Linnæus, Mantissa, i. p. 538 (1771).

The larva of *P. tetrio* is well known to Mr. Bowrey, who describes it as "black with yellow bands, and with the head, feet, anal claspers, and horn scarlet."

65. Cosmosoma tyrrhene, Hübner, Samml. ex. Schm. Zutr. figs. 483, 484.

66. Cosmosoma auge, Linnæus, Syst. Nat. ii. p. 807. n. 46 (1766).

67. Empyreuma pugione, Linnæus, Syst. Nat. ii. p. 807. n. 45 (1766).

68. Are marginata, Drury, Ill. Ex. Ent. ii. pl. 22. fig. 2 (1773).

69. Composia sybaris, Cramer, Pap. Exot. i. pl. 71. fig. E (1779).

70. Euchætes insulata, Walker, Lep. Het. iii. p. 734. n. 5 (1855).

71. Deiopeia speciosa, Walker, Lep. Het. ii. p. 568 (1854).

Common in grass. The larva much resembles that of our European *Callimorpha jacobeæ*: it is orange, banded with warty-black bands, and with rather long black bristles projecting from the warts; head and legs reddish.

72. Cincia pallida, n. sp.

Primaries white, with cream-coloured veins, a black dot at the base; four oblique parallel equidistant angular series of black dots, also a marginal series; secondaries pearly grey; head and collar white; thorax white dotted with black; abdomen pearly grey. Under surface pale greyish, the spots obsolete; costal margin of primaries white, with three pale brown spots beyond the middle; body whitish. Expanse 1 inch 1 line.

73. Mulona lapidaria, Walker, Lep. Het. Suppl. v. p. 1896 (1866).

74. GLISSA VARIEGATA, Walker, Lep. Het. ii. p. 380 (1854).

This beautiful little species seems to be not uncommon. Mr. Bowrey found it settled on the under surface of the leaves of coffee.

75. LAURONA ERGOLIS, Walker, Lep. Het. ii. p. 335 (1854).

This common species is said to have a hairy caterpillar.

76. EUTHISANOTIA TIMAIS, Cramer, Pap. Exot. iii. pl. 275. fig. B (1782).

77. EUGLYPHIA HIEROGLYPHICA, Cramer, Pap. Exot. ii. pl. 147. fig. D (1779).

The larva of this species, which is slightly hairy, feeds on lilies.

78. OCHRIA NIVEOPICTA, n. sp.

Primaries above deep coppery red; the orbicular and reniform spots represented by circles of white dots enclosing white spots; costal margin white-dotted; a few scattered white dots on basal area, a discal series and a marginal series; a submarginal series of white spots: secondaries shining brown, slightly darker at outer border: body corresponding in colour with the wings. Under surface pinky brown; internal areas of the wings more or less broadly white; primaries with pale discocellular spot and outer border. Expanse 1 inch 4 lines.

79. PRODENIA IGNOBILIS, n. sp.

Primaries above shining whity brown; costal margin whitish, crossed by oblique brown spots; two black dots and a small brown spot at the end of the cell; a double discal series of black dots on the veins; an ill-defined series of internervular bronzy streaks; an oblique bronzy streak from the second median interspace to near the base of the inner margin, where it terminates in a black line; a marginal series of black dots; fringe bronzy, crossed by white lines from the ends of the veins, and with a white internal margin: secondaries semitransparent opaline white: body pale brown, the head, collar, and tegulæ whitish; a darker brown patch on each side of the collar. Wings below white, most of the markings obsolete; primaries sericeous, with bronzy-tinted fringe and costa; a marginal series of black dots; body below whitish, varied with pale reddish brown. Expanse 1 inch 3 lines.

This species and the next have the general aspect of *Leucania*.

80. PRODENIA PAUPER, n. sp.

Primaries above shining whity brown, with five or six black costal dots and three (indicating the reniform spot) at the end of the cell; an arched discal series of minute black dots on the veins; outer border rather dusky; a marginal series of minute black dots: secondaries semitransparent opaline white; the apex with a brown marginal line; costal area pale brown: body whity brown; front of the collar brown, with a black posterior edge. Under surface shining, the markings obsolete. Expanse 1 inch 3 lines.

81. CONDICA PALPALIS, Walker, Lep. Het. ix. p. 240 (1856).

82. APAMEA INTERMITTENS, Walker, Lep. Het. xv. p. 1686 (1858).

83. PERIGEA MOBILIS, Walker, Lep. Het. x. p. 277 (1856).

84. HADENA ABIDA, Felder, Reise der Nov. Lep. iv. pl. 109. fig. 7 (?).

The example from Jamaica has the apices of the primaries rather more rounded and the pattern less strongly indicated than in Felder's figure; still it is so like it that it would be unsafe to regard it as a distinct species.

85. ELOUSA ALBICANS, Walker, Lep. Het. xiii. p. 1118 (1857).

This genus is nearly allied to *Erastria*; the same species is described subsequently by Walker under the name of *Erastria includens*.

86. GONODONTA NUTRIX, Cramer, Pap. Exot. iv. pl. 312. fig. B (1782).

87. HYBLÆA PUERA, Cramer, Pap. Exot. ii. pl. 103. figs. D, E (1779).

88. COSMOPHILA EROSA, Hübner, Samml. ex. Schm. Zutr. figs. 287, 288.

89. DECELEA BOWREYI, n. sp.

Primaries pale brown mottled with black; a broad central band (the internal third of which is black and the remainder of the ground-colour), limited internally by a black line, and externally by an angulated and slightly irregular white line; a black line across the base, terminating on interno-median area in a triangular black patch; several black costal dashes and an oblique black line from the costa across the central band; a subcostal greyish lunule partly bordered by pearly scales beyond the central band; a very irregular dentate-sinuate whity-brown discal stripe with dark borders; a submarginal series of black bracket-like markings separated by white dots upon the veins; fringe spotted with dark brown: secondaries reddish brown, darker towards the outer border; a black sinuated marginal line interrupted on the veins by white dots; fringe pale brown, bordered and intersected by parallel dusky lunules: body pale brown speckled with black; collar with an ill-defined central black line, the border pearly; a few pearly whitish scales scattered over the thorax; abdomen with three very prominent dark brown dorsal tufts or masses of scales. Primaries below pale olive-brown slightly sericeous; a black costal spot before the middle, and a second smaller one beyond the middle; the remainder of the costa alternately brown and white; disk darker than the rest of the wing, crossed by a nearly straight dusky line, and limited externally by a very irregular dentate-sinuate line; a sinuated black marginal line, interrupted by white dots upon the veins; fringe with red-brown

external spots: secondaries pinky brown, crossed by two dark lines which form a central semicircular area, in the middle of which is the dark discocellular lunule; a dusky submarginal belt; margin and fringe as above: body below pinky-brown; tarsi black, banded with testaceous or pinky whitish. Expanse 1 inch 6 lines.

This singular species has somewhat the aspect of a *Dasychira*; it seems, however, to be allied to the genus *Nœnia*.

90. HOMOPTERA TERROSA, Guénée, Noct. iii. p. 11. n. 1332 (1852).

Whether Walker has rightly identified this species I cannot say, but his *H. posterior* is the same as his *H. terrosa*.

91. BOLINA FASCIOLARIS, Hübner, Samml. ex. Schm. Zutr. figs. 443, 444.

92. BOLINA CUNEARIS, Guénée, Noct. iii. p. 70. n. 1414 (1852).

93. BOLINA PERPENDICULARIS, Guénée, Noct. iii. p. 65. n. 1404 (1852).

94. BOLINA EVELINA, n. sp.

Markings nearly as in *B. ochrodes*, but the primaries slaty grey, the large reniform patch of the same colour, the internal two thirds of the central band whity brown mottled with greyish brown; two triangular black subcostal spots resting upon the inner margin of the trisinuate red-brown discal stripe; external area soft silver-grey; marginal line yellowish; fringe brown, white at external angle; secondaries with the basal half and fringe white, the external half black; thorax lilacine, abdomen grey. Wings below with the basal half and fringe white, the external half blackish; primaries with a white spot just beyond the cell; fringes tipped with black; body white; the palpi and legs fringed with pink. Expanse 1 inch 9 lines.

Most like *B. agrotoides* in the pattern and coloration of the primaries.

95. BOLINA? CONFIRMANS, Walker, Lep. Het. xiii. p. 1157. n. 25 (1857).

This species would, in my opinion, be better placed with *Biula*. I can find no difference whatever between *Syneda limbolaris* (a species much like a *Bolina*) and *Grammodes grandirena* of Walker's Catalogue.

96. PEOSINA NUMERIA, Drury, Ill. Ex. Ent. i. pl. 23. fig. 5 (1770).

The species from Venezuela is quite distinct, the specimens from St. Domingo identified by Walker as *P. mexicana* being referable to *P. numeria*. For Walker's *P. numeria* I would propose the name of *Hypogramma confusa*; it is nearly allied to *Hypogramma sublucida*.

97. Thysania zenobia, Cramer, Pap. Exot. ii. pl. 115. A, B (1779).

98. Erebus odora, Linnæus, Syst. Nat. ii. p. 811. n. 11 (1766).

The chrysalis of this species is enclosed in a slight cocoon, to which leaves are attached.

It appears to me that at least five species have been confounded under this name; of these three are already figured as follows:—

1. *E. odora* of Linnæus, in which both sexes are alike in general pattern and both shot with purple; Drury's figure represents a specimen in which the purple seems to have faded. Jamaica and St. Domingo.

2. *E. odorata* of Clerk, in which both sexes are again alike, but different from *E. odora*, a strongly dentate whitish belt intersected by black lines running through both wings. St. Domingo and New Granada.

3. *E. agarista* of Cramer, in which the male has a pale discal sinuated belt, and the wings from the centre shot with rose-colour; whilst the female has the belt snow-white, intersected by black lines and a feeble lilacine tint beyond the centre of the wings. Brazil.

E. agarista is the most richly-coloured species.

We also have a female from Havannah, which is certainly different, and examples of a species which seems to be distinct from St. Kitts, Nevis, and New Granada.

99. Phurys garnoti, Guénée, Noct. iii. p. 307 (1852).

In my opinion this species would be better placed in *Trigonodes* than in *Phurys*.

100. Achæa indistincta, n. sp.

Primaries red-brown, the base and a diffused belt beyond the middle paler; a nearly triangular subapical costal chocolate-brown patch bounded externally by a white line; an apical dark-brown spot; costa greyish: secondaries smoky brown, crossed at the middle by a whitish stripe; fringe white; a submarginal sordid white spot near the anal angle: body whitish. Wings below pale olive-brown, with the basal area whitish; primaries with an abbreviated sordid white discal band; a bifid subapical white spot: secondaries with brown discocellulars, followed by a white central band; a marginal subanal white spot; fringe snow-white: body creamy-white. Expanse 1 inch 9 lines.

Allied to *A. cyllota*.

101. Poaphila cinerea, n. sp.

Ashy grey, wings with diffused chocolate-brown external area; a faint indication of an irregular central belt, expressed by zigzag limiting lines; an indistinct grey zigzag discal line across the brown area; primaries with a white spot at the inferior angle of the discoidal cell. Under surface paler; the outer edge of the indistinct

central belt relieved by a whitish border; primaries without the white spot; secondaries with an ill-defined dusky discal belt; fringe white. Expanse 1 inch 3 lines.

102. Remigia disseverans, Walker, Lep. Het. xiv. p. 1495 (1857).

This species is identical with *R. persubtilis* of Walker, and allied to his *Ophiusa delinquens*.

103. Rhescipha elegans, n. sp.

Allied to *R. servia*, but with narrower wings, the palpi much more slender; the primaries with less distinctly sinuated margin; a small white dot on lower median interspace close to the margin; no yellow spots; secondaries pale reddish instead of smoky brown, the base and costal area white; thorax burnt-sienna red like the primaries; abdomen very pale brown, almost white: wings below much whiter than in *R. servia*; body below snow-white, palpi and tibiæ of anterior and middle pairs of legs brown. Expanse 1 inch 7 lines.

I find that the genus *Rhescipha* is most nearly allied to *Tetratocera*.

104. Thermesia gemmatalis, Guénée, Noct. iii. p. 355. n. 1828 (1852).

105. Azazia monstratura, Walker, Lep. Het. xv. p. 1564 (1858).

This species is certainly nearer to *Azazia* than to *Thermesia*, with which genus Walker placed it.

The following genus has been a puzzle to me; but it appears to be more nearly allied to *Euclidia* than to any thing else.

Calliscotus, n. gen.

Form and general structure of *Euclidia*, but the body less robust, the palpi shorter, with very short terminal joint, porrect; abdomen shorter; primaries comparatively longer; subcostal branches of secondaries emitted from a footstalk; discocellulars concave but very oblique. Type *C. bowreyi*.

106. Calliscotus bowreyi, n. sp.

Primaries pale brown, crossed by numerous irregularly dentate-sinuate black lines; a broad dark-brown subbasal belt, beyond which are two large patches a little paler than the ground-colour, outlined in black; in the middle of the upper one is a small ocellus, representing the reniform spot, and pale brown edged with black and encircled by a yellowish iris; a few scattered white scales on the external area; subapical area dusky; a dentate-sinuate pale line, white, and followed by triangular black spots between the veins; an interrupted black marginal line: secondaries fuliginous brown, with dusky external border; a dark angulated discal stripe and a blackish anal spot: body whity brown. Wings below whity brown,

with discocellular spots, angulated discal stripes, and external borders black; the apices, a triangular spot at the centre of each outer margin, the fringes, and some spots at the anal angle of secondaries white; body below whitish. Expanse 1 inch 7 lines.

A pretty species, somewhat calling to mind the Geometrid genus *Scotosia*.

107. CAPNODES? CALIDA, n. sp.

Bright clay-colour; wings with two very irregular central brown-bordered whitish dentate-sinuate lines from costa to inner margin, each dens terminating in a white dot; outer border red-brown, bounded internally by a pale zigzag line; a nearly marginal series of dots black internally and white externally: primaries with a snow-white spot and one or two dots at the end of the cell; secondaries with a black-centred whitish spot at the end of the cell. Wings below considerably paler and irrorated with smoky brown; secondaries whitish towards the base and inner border, the spots at the end of the cell less strongly defined than above, the lines obsolete. Expanse 1 inch 2 lines.

This species has rather long palpi for a *Capnodes*, but in general form, style of coloration, and every thing else agrees with that genus.

108. URANIA SLOANUS, Cramer, Pap. Exot. i. pl. 85. figs. E, F (1779).

109. NYCTALÆMON ÆGISTUS, Fabricius, Mant. Ins. ii. p. 10. n. 93.

110. CHÆRODES TRANSTINCTA, var., Walker, Lep. Het. xx. p. 20 (1860).

111. DREPANODES PIONARIA, var., Walker, Lep. Het. xx. p. 71 (1860).

112. BOARMIA DELICATA, n. sp.

Wings above chalky white; the basal area and disk of primaries, and the external half of secondaries, crossed by parallel undulated testaceous bands; a well-defined zigzag stripe across the middle of the disk; two central angulated slender black lines, between which is a black discocellular annulus on each wing; a marginal series of black dots: body white; abdomen banded with testaceous. Under surface white; wings with black discocellular spots, pale greyish-brown discal belt, and black marginal dots; primaries with the costa black-spotted. Expanse 1 inch 6 lines.

113. AMPHIDASYS ARNOBIA, Cramer, Pap. Exot. iv. pl. 383. fig. I (1782).

114. JODIS KINSTONENSIS, n. sp.

Wings above emerald-green, crossed by a wavy yellowish discal line; fringes lemon-yellow, tipped with white; discocellular spots

black, encircled with orange: frons deep red, with white angles and a central longitudinal green stripe; crest deep red, speckled with white; antennæ deep red, annulated with white; back of head, collar, and tegulæ emerald-green; thorax and abdomen pale pinky brown or flesh-colour. Wings below much paler than above, especially at outer margin, sericeous; primaries with a small red apical spot; palpi above dark red tipped with white, below pearly white; pectus snow-white, legs and venter pearly white. Expanse 1 inch 1 line.

115. MECOCERAS BITACTARIA, Walker, Lep. Het. xxii. p. 607 (1861).

116. HYRIA VINACEA, n. sp.

Laky purple, with rather broad ochreous outer border, between which and the general colour is a belt, reddish externally and slaty grey internally; abdomen with ochreous margins: wings below paler than above, the border cream-coloured; body below cream-coloured. Expanse 7 lines.

A pretty little species.

117. EROSIA INCONGRUA, n. sp.

Sordid white, reticulated and speckled with brown: primaries with the base of costa cinereous; an irregularly elbowed testaceous line across the basal third; an angulated dark brown discal line (blood-red in certain lights), terminating on inner margin in a semicircular brown spot; four submarginal brown spots on the apical half of outer border: secondaries with a black-edged sagittiform streak through the cell; a white-edged elbowed blackish line across the disk, bounded internally near the abdominal margin by an oblong patch of red-brown; apical area clouded with reddish brown; border between the caudal processes greyish, black-edged internally; two submarginal black dots on the median interspaces: body white, with grey head and collar. Under surface sordid white, speckled with black. Expanse 9 lines.

118. ACIDALIA UMBILICATA, Guénée, Phal. i. p. 504. n. 872 (1857).

119. ACIDALIA APPARITARIA, Walker, Lep. Het. xxii. p. 733. n. 145 (1861).

120. MACARIA ACIDALIATA?, Walker, Lep. Het. xxiii. p. 893. n. 33 (1861).

There is a broken example of what appears to be a species of *Anisodes*; but I hope Mr. Bowrey will send us a good example some day, and thus enable me to identify it with certainty.

121. YPSIPETES? ANOMALA, n. sp.

Primaries above with the basal third and costa stramineous, the rest of the wing silvery brown; basal area crossed by sinuated red-

dish ochraceous lines, and the rest of the wing by sepia-brown lines; a discal series of white-edged spots, black on the discoidal interspaces, otherwise brown; median vein and bases of the branches black-spotted: secondaries semitransparent sordid white, with opaque outer border and grey submarginal stripe: body stramineous, streaked with reddish ochraceous. Wings below cream-coloured, with greyish-brown submarginal belt; body white. Expanse 1 inch.

The only example obtained of this singular species is, unfortunately, rather rubbed.

122. Scotosia catocalaria, Walker, Lep. Het. xxxv. p. 1689 (1866).

123. Pterocypha stellata, Guénée, Phal. ii. p. 443. n. 1627 (1857).

124. Hyposidra ochrea, n. sp.

Ochreous; wings with a silvery gloss, excepting the outer border, a discal belt, and a costal dash upon the primaries, which are of a clearer yellow colour; primaries with the lower half of the discal belt edged externally with orange and plumbaginous; edge of fringe orange: secondaries with two parallel zigzag purplish-brown streaks across the abdominal half, the upper streak intersected by a plumbaginous line; edge of fringe orange: head brown. Wings below bright ochreous, with an oblique discal purplish streak; primaries with diffused silvery-whitish external area; pectus whitish, legs testaceous. Expanse 1 inch 3 lines.

I have to thank Mr. F. Moore for the identification of this genus, the type of which is a Javan species, not in the Museum collection.

125. Hypena lunifera, n. sp.

Primaries above lilacine brown, crossed by two slender blackish zigzag lines, between which is an orange lunule, with its inferior extremity white and edged with black, representing the reniform spot; an orange dot at the costal extremity of the second black line, and two subcostal dots of the same colour close to apex; a marginal series of black dots: secondaries pale smoky brown, darker towards the outer margin, crossed at the middle by an arched series of black spots; a marginal series of black dots: body dark brown, back of thorax slightly lilacine. Primaries below greyish brown; costal area speckled with whity brown; the discocellulars and an arched discal series of spots dusky; a marginal series of depressed triangular spots: secondaries sordid white, speckled with dark brown; a black discocellular lunule; two discal parallel zigzag dark brown lines, the outer one ill-defined; a marginal series of black spots, as in primaries; pectus smoky brown. Expanse 1 inch.

126. Syngamia florella, Cramer, Pap. Exot. iv. pl. 348. fig. L (1782).

127. Desmia orbalis, Guénée, Delt. p. 192. n. 128 (1854).

128. Desmia prognealis, Walker, Lep. Het. xvii. p. 346. n. 22 (1859).

129. Samea chlorophasma, n. sp.

Wings hyaline, slightly yellowish, with stramineous borders; outer border spotted with rust-red; primaries with three mustard-yellow irregular lines across the basal area, followed by a straight golden brown transverse line, then a stramineous belt margined with brown, followed by a quadrate spot of the same character at the end of the cell (its inner edge continued as a single line to internal margin); an angulated brown discal line, terminating at inner margin in a rusty reddish spot: secondaries with a black-edged stramineous discocellular spot, from which a brown line runs obliquely to inner margin; an angulated brown discal line, terminating at anal angle in a quadrate rusty reddish spot: thorax stramineous, streaked with mustard-yellow; abdomen testaceous. Wings below altogether paler than above, the markings less distinct; body below silvery white; palpi yellow; legs cream-coloured. Expanse 10 lines.

A delicate golden-looking little species.

130. Agathodes monstralis, Guénée, Delt. p. 209. n. 165 (1854).

131. Hymenia perspectalis, Hübner, Ex. Schm. Zutr. fig. 101.

132. Conchylodes diihtheralis, Hübner, Ex. Schm. Zutr. figs. 691, 692.

133. Phakellura hyalinata, Linn. Syst. Nat. iii. 2, p. 873 (1766).

134. Phakellura nitidalis, Cramer, Pap. Exot. iv. pl. 371. fig. F (1782).

Mr. Bowrey says that he found the species of *Phakellura* feeding upon the flowers of gourds.

135. Margaronia quadristigmalis, Guénée, Delt. p. 304. n. 319 (1854).

136. Botys butyrosa, n. sp.

Wings dull lemon-yellow: primaries with the costa sericeous, a feeble opaline tint beyond the middle, an angular pale brown line across the basal third, and a sickle-shaped pale brown line across the disk; marginal line tawny: secondaries with opaline costal area; marginal line tawny: head and prothorax yellow; rest of the body shining creamy white; abdomen with a yellow dorsal line; projecting frontal tuft white; palpi brown above, white below. Body below pearly white; legs pearly white, with the femora and the anterior tibiæ brown; wings below opaline. Expanse 1 inch 7 lines.

137. Botys lucilla, n. sp.

Bright golden yellow, with a very slight pinky spot; wings with the two usual lines greyish; primaries with the discoidal spots represented by grey dots; secondaries with whitish abdominal area; head pearly white; abdomen pale yellow. Wings below paler than above, opaline; body pearly white. Expanse 9 lines.

138. Botys principalis, Lederer, Wien. ent. Monatschr. vii. pl. 10. fig. 17 (1873).

139. Botys glaucusalis, Walker, Lep. Het. xviii. p. 576. n. 51 (1859).

140. Botys agavealis, Walker, Lep. Het. xviii. p. 574. n. 47 (1859).

141. Botys eurytalis, Walker, Lep. Het. xviii. p. 576. n. 50 (1859).

142. Botys campalis, Guénée, Delt. p. 344. n. 397 (1854).

143. Botys gastralis, Guénée, Delt. p. 346. n. 400 (1854).

144. Botys eratalis, Walker, Lep. Het. xviii. p. 578. n. 54 (1859).

145. Botys olivia, n. sp.

Pale olive-brown, with bright bronze reflections; the usual lines grey; orbicular and reniform spots outlined in grey; body greyish brown. Wings below considerably paler, whitish towards the base, sericeous; inner line absent; body white. Expanse 10 lines.

Nearly allied to *B. plebeialis*.

146. Botys helcitalis, Walker, Lep. Het. xviii. p. 574. n. 46 (1859).

147. Mecyna reversalis, Guénée, Delt. p. 409. n. 531 (1854).

148. Anerastia ignobilis, n. sp.

Primaries above pale pinky brownish or flesh-colour, the infero-exterior quarter of the wing slaty grey; the median vein, its two superior branches, the terminal portions of the subcostal branches, the extreme ends of the remaining veins, and the centre of the submedian vein silvery white; an abbreviated longitudinal apical streak and a subcostal streak black; one or two minute black dots on the median and submedian veins: secondaries hyaline, iridescent, with dusky outer border: thorax red-brown, streaked with pinky white; head and palpi white; abdomen grey. Primaries and body below pale shining brown; secondaries as above. Expanse 11 lines.

149. Argyria vestalis, n. sp.

Silvery white: primaries with a small triangular spot at the

middle of costa, an oblique dash followed by a triangular spot near apex, and a submarginal stripe, with zigzag inner edge dark chocolate-brown; outer border and fringe pale brown, traversed by two straight dusky lines; a minute brown spot at middle of inner margin: base and sides of palpi chocolate-brown. Below silvery white; the costal area of primaries pale brownish. Expanse 11 millimetres.

Like *A. insons* of Felder, but only half as large; also allied to *A. chrysogyrans*, Walker (MS.?).

150. CYDOSIA NOBILITELLA, Cramer, Pap. Exot. iii. pl. 264. fig. G (1782).

151. TINEA?, sp.

This insect has lost all the fringes of its wings, so that I cannot recognize its genus. The neuration of the secondaries seems to be exactly that of *Tinea*; but the head is too broad, and the palpi are too long and robust; in coloration and the general form of its wings it is most like *Cerostoma vittella*.

152. PTEROPHORUS ASPILODACTYLUS, Walker, Lep. Het. xxx. p. 941. n. 43 (1864).

5. Descriptions of new Land-Shells from Japan and Borneo. By EDGAR A. SMITH, F.Z.S.

[Received April 15, 1878.]

HELIX (CAMENA) LEWISII.

Testa dextrorsa, conoideo-globosa, subanguste umbilicata, oblique striata, alba, epidermide tenui luteo-olivacea induta, fascia angusta fusca ad peripheriam picta; anfract. 6½, convexiusculi, sensim crescentes, ultimus rotundatus, antice breviter descendens; apertura obliqua, intus alba; perist. undique expansum, margine columellari sordido-roseo tincto, superne late expanso et reflexo.

Diam. max. 35 mill., min. 29; alt. 24.

Hab. Japan (*George Lewis*).

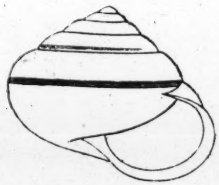
Perhaps the most closely allied Japanese species to this one is *H. miranda*, A. Adams. From it *H. lewisii* differs in having a more conical spire, a narrower umbilicus, finer oblique striæ, and no spiral sculpture.

The oblique striæ at the suture are rather deeply incised and more crowded than on the other parts of the whorls, many of them extending only about a line from the suture and then gradually fading away. The first four whorls differ from the last two in being obliquely punctato-striate, instead of exhibiting an ordinary striation. The brown band is situated a very little above the middle of the body-whorl, and passing just above its suture, is visible on two

or three of the preceding volutions. The umbilicus is very deep and penetrable to the apex of the shell, but rather narrow, occupying about one seventh of the smallest diameter.

The peristome rather broadly expanded and white, with the exception of the columellar and basal margins, which are stained with a dirty pinkish colour. Over the umbilicus it is broadly expanded, reflexed, and joined to the upper margin by a thin callosity. This species is quite distinct from *H. myomphala*, Martens, and, al-

Fig. 1.



Helix (*Camena*) *lewisii*.

though agreeing in the style of coloration, differs in form and the umbilicus.

The single example in the British Museum was presented by Mr. George Lewis.

HELIX (CAMENA) CONGENITA.

Testa suborbicularis; spira breviter conica, subaperte umbilicata, tenuiuscula, pallide straminea, zona lata interrupta irregulari fusca, vel strigis latis fuscis infra medium anfr. ultimi ornata et hic illic supra strigis obliquis paucis indistinctis notata, interdum ad peripheriam zona angusta fusca cincta, et umbilico aliquando fusco tincto; anfractus $5\frac{1}{2}$–6, *convexiusculi, lineis incrementi elevatis, filiformibus, obliquis, flexuosis et striis minutissimis spiralibus inter lineas elevatas sculpti, ultimus angustiusculus, antice prope labrum breviter subitoque descendens; apertura subhorizontalis, intus livida, fusco tincta; peristoma tenue, livido-fusco et albo diverse pictum, undique reflexum et expansum.*

Diam. max. 30 mill., min. 25, alt. 19; apert. $16\frac{1}{2}$ long., 14 lat.

Hab. Japan.

This species partakes in a great measure of the form of *H. congener*, recently described by me in these 'Proceedings' (1878, p. 105). The spire, however, is a little more elevated, the last whorl a trifle less robust, and the aperture narrower.

The sculpture of this species is much coarser, the lines of growth being developed into thread-like liræ, and the spiral striæ invisible to the naked eye, and more conspicuous between than upon the

oblique thread-like lines of growth when viewed under a lens. The descent of the body-whorl is very sudden and brief. The whorl, owing to the expansion of the peritreme, has a constricted appearance in that part.

The umbilicus is a little more open than in *H. congener*, and consequently more perspective. The coloration of this species is not easily definable. The ground-colour is pale straw, the oblique raised liræ being more opaque and yellower. The body-whorl below the periphery is stained with brown, or looks as if it were scorched. The colouring takes the form of a very broad interrupted transverse band, or, in other words, of wide blotches or stripes. The latter are sometimes continued upon the upper half of the whorl, and are also here and there faintly observable on the upper volutions. One

Fig. 2.



Helix (*Camena*) *congenita*.

specimen has a narrow peripherial brown band. The body-whorl is stained with brown outside the tip; and this, owing to the thinness of the shell, produces a brownish labrum, which in some places, particularly at the extreme edge and in the columellar region, is somewhat whitish. It is rather widely expanded at the base and columella, and is a trifle reflexed everywhere. The aperture is very transverse, in fact almost horizontal; it is of a livid white colour within, exhibiting the brown marking of the exterior.

Subgen. Myxostoma, Troschel.

Testa plus minusve discoidea, late umbilicata; apertura circularis; peristoma duplex, margine interiore superne plerumque leviter sinuato, externo supra sinum alatim expanso. Operculum corneum, crassum, inferne paulo concavum, in medio nucleo prominulo, extus marginibus anfractuum lamellosis.

This section of *Cyclophorus* agrees with *Pterocyclos* in the form of the shell and its peristome, but differs in having a thick horny operculum, with the margins of the whorls lamellated exteriorly, that of *Pterocyclos* being calcareous and spirally laminated.

Cyclophorus (Myxostoma) bathyrhaphe.

Testa discoidea, apertissime umbilicata, spira parum elevata, sub epidermide luteo-olivacea sordide vel cæruleo-albida; anfr. $5\frac{1}{2}$, *rotundati, sutura valde canaliculata sejuncti, ultimus sat magnus*

superne ad canalem suturalem carina lamelliformi munitus, lineis incrementi tenuibus leviter obliquis sculptus; apertura oblique circularis, intus cæruleo-alba; peristoma duplicatum, margine interiori lævi vix expanso, superne prope anfractum parum profunde sinuato, externo anguste expanso, superne ala parva leviter fornicata instructo. Operculum corneum, concentricum, multispirale, utrinque concavum, extus lamellis brevibus striatis obtectum.

Diam. max. 31 mill., min. 22, alt. 15, apert. diam. intern. 9.

Hab. Borneo (*G. B. Sowerby*).

Shell discoidal, openly umbilicated, and clothed with a thin uniform yellowish-olivaceous epidermis. Beneath this it is of a dirty or bluish-white tint. The spire is only slightly raised above the last whorl. The whorls, about five in number, are convex and bordered by a deep and broadish channel at the suture, the outer margin of the canaliculation being produced into a thin lamellar ridge or keel; and outside this carina the whorls are a trifle depressed or excavated.

Fig. 3.



Cyclophorus (*Myxostoma*) *bathyraphe*.

The sculpture consists merely of the lines of growth, which are fine and somewhat oblique. The aperture is slopingly circular, bluish white, and has a double lip. The inner edge is thicker than the outer, and scarcely at all everted. The sinus is distinct, moderately deep, and situated at the termination of the sutural canaliculation. The outer rim is somewhat expanded but not reflexed, narrowest on the left side where it touches the whorl, and thin and sharp at the extreme edge. Above it is expanded in the form of a small wing, which slightly arches over the sinus and has a tendency to a deflection in front.

This species in the nature of its operculum agrees with the genus *Myxostoma*, which was founded by Troschel ('Zeitschrift für Mala-

kozoologie,' 1847, p. 44) for the reception of the curious shell figured by Martyn under the name of *Lituus brevis*.

It only differs from *Myxostoma* in having the inner lip of the aperture sinuated above, and in the wing-like expansion of the outer rim not leaning upon the penultimate whorl. The canaliculate suture, I presume, is only a specific character.

In all respects agreeing with this species are two others, *Cyclostoma planorbulus*, Lamarck, and *Pterocyclos albersi*, Pfr. The former has had several localities quoted as its home, among which are Senegal?, Philippine Islands, Bengal, Java, Borneo, Sumatra (in Mus. Cuming), and Pulo Condore Island. Which of these is the true habitat I cannot say with certainty, nor am I aware that it has ever been definitely settled; there is, however, some slight evidence to show that the last locality is the correct one. We are also in the same state of uncertainty respecting *Pt. albersi*. Pfeiffer described the species not knowing its locality; and Benson ('Annals of Nat. Hist.' 1857, vol. xix. p. 208) is wrong in attributing a shell found at Teria Ghát, Khasia hills, India, to this species; for it was, as shown by Hanley ('Conchologia Indica,' p. 56), only a variety of *Pt. parvus*, Pearson.

Here, then, is a small group of four species, all having a Pterocycloid expansion of the outer rim of the lip, and an operculum of precisely the same structure. Three of them have channelled sutures to the whorls, are of a depressed orbicular form, and have the inner lip sinuated at the termination of the sutural channel. The fourth (*brevis*) and the type of *Myxostoma* lacks the channelled suture, and has only the slightest trace of a sinus in the lip—both of which characters, especially the former, I consider more specific than generic. From *Cyclophorus* with its simple concentric thin horny operculum and simple lip to the aperture, the different operculum and expansion of the lip of *Myxostoma* warrant, at all events, a subgenerie separation.

There are two or three Burmese species (*Cyclophorus pinnulifer*, Benson, *C. calyx*, Benson, and *C. hispidulus*, Blanford) which will also conveniently range under this genus. They are depressed subdiscoid shells with a double rim to the aperture, the outer lip with a small superior wing-like expansion, and the operculum thick, horny, with the outer margins of the whorls lamellated. For this group Blanford proposed the name *Scabrina* (Journ. Asiatic Soc. Bengal, 1863, p. 322).

The museum is indebted to Mr. J. B. Sowerby for a single specimen of this interesting species.

6. On the Fruit-Pigeons of the Genus *Ptilopus*.

By D. G. Elliot, F.R.S.E. &c.

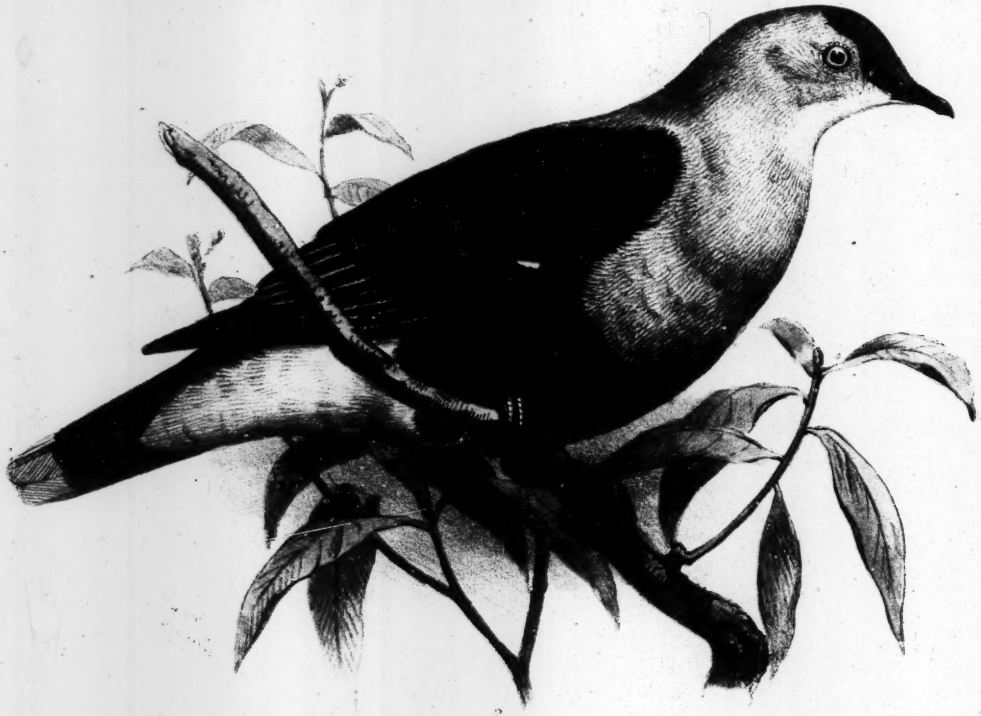
[Received April 16, 1878.]

(Plates XXXIII. & XXXIV.)

My material for the present paper has been most ample, and was derived from the following sources:—the collection of the Paris Museum, rich in the types of the older authors, such as Hombron and Jacquinot, Lesson, Quoy and Gaimard, Bonaparte, Temminck, Knip, &c.; the collection of the British Museum, containing the types of Gray, Gould, Wallace, &c.; a series of special desiderata from the Museum at Genoa, collected by D'Albertis, Bruijn, &c., and from the Museum of Count Turati at Milan; a large number of various species from different localities brought by Laglaize, and especially by M. Raffray, now in the Paris Museum; the species of *Ptilopus* procured by the 'Challenger' Expedition, also those from Duke-of-York Island sent by Mr. Brown; specimens in Messrs. Salvin and Godman's collection obtained by Mr. Layard in the Fiji Islands; and, lastly, the type specimen of Dr. Finsch's recently described *Pt. ponapensis*.

Probably no such complete series, illustrating the species of this group from all localities, has ever before been at the disposal of any one wishing to study these birds; and it is very safe to say that, unless I had had before me the actual specimens described and figured by the earlier writers, especially of those species belonging to the islands of the Polynesian subregion, this paper could never have been written without great danger of adding to the confusion already existing in these perplexing birds. The descriptions in many instances are so meagre and unsatisfactory, and the illustrations, in certain cases, so totally unlike the originals, that it is utterly impossible to recognize the species by them; but having had the specimens, in the majority of instances, before me, I have been enabled to ascertain without difficulty to what species these doubtful birds (made such by their authors) really belonged. Some of my conclusions may be found to be quite at variance from those of other authors; but in all cases (unless otherwise stated), let it be remembered, I have judged from the vast material at my command, and, having brought to my task a mind totally unprejudiced by any preconceived opinions, it will not perhaps be deemed too great a request should I ask that, if any of the decisions arrived at in this paper are rejected, they may be condemned only after the examination of material at least approximating somewhat to that which I have consulted, and such as will clearly show my views to be erroneous.

Probably there are but few groups of birds so liable to lead a naturalist astray as those species of *Ptilopus* inhabiting the Pacific islands; and, without an ample series before him, no one could accurately diagnose the forms that really are distinct. In this special division of the genus the collection of the Paris Museum is rich,



J. Gould del.

Hancart imp

PTILOPUS PICTIVENTRIS.



PTILOPUS GESTRO.

PTILOPUS GESTRO.

probably beyond all others, through the material brought to France by the scientific expeditions known as the voyages of the 'Astrolabe,' 'Coquille,' 'Vénus,' 'Zélé,' 'Pôle Sud,' &c. Many types are among these specimens; and it has been by their assistance I have worked out the synonymy of the species of the Polynesian subregion. All the species figured by Bonaparte in his 'Iconographie des Pigeons' are also in the Museum, and have been invaluable in enabling me to arrange the synonymy and determine the species to which they belong, which has not been always possible from the work itself, some curious and unaccountable errors having been committed by the authors.

Man is fallible, and it is not to be supposed that in an extensive review of some seventy species no errors have been committed; but, having endeavoured to verify every statement made in this paper (taking nothing for granted), I may venture to hope that inaccuracies have been reduced to a minimum.

The pleasing duty now alone remains for me to express my thanks to those who have assisted me with material during the time I have been occupied with this memoir, without whose aid it certainly never could have been properly completed. To my friend Prof. A. Milne-Edwards, to whom I have already so often given my testimony as to his willingness to accord every facility for the study and examination of the unequalled collection of birds and quadrupeds under his charge, I am again under obligations for every assistance rendered to me during the months I have been engaged upon this group. Not only was every specimen the Museum contained continually at my disposal, but also many books from his own library were placed at my service as, from time to time, I had need of them. It is only by such enlightened assistance and cooperation from those who are at the heads of great departments in European museums that any satisfactory work can be accomplished by a naturalist who may not be himself attached to such institutions. To Dr. Oustalet, Aide-Naturaliste, I also desire to express my thanks for much assistance continually and freely given. To my friend Count T. Salvadori I would acknowledge my indebtedness for a very valuable series of specimens not otherwise obtainable, procured by the consent of the Marquis G. Doria from the Museum at Genoa, among which were some types of Count Salvadori's lately described species. To Count H. Turati I am also obliged for specimens from his magnificent museum. To my friend Dr. Sclater I am indebted for opportunities of examining the collection of the 'Challenger' Expedition, and also those sent to him from different islands in the Pacific, containing various types of the species described by him from time to time; and to Messrs. Salvin and Godman for specimens from their collection obtained by Mr. Layard, and which I brought to Paris for comparison with those in the Museum collection. To Mr. Sharpe, who placed at my disposal all the specimens of this genus in the British Museum, among which were various types of much service in determining some doubtful points, I am greatly obliged. And, lastly, to the Directors of the Museum Godeffroy, who sent me the types of *Ptilopus pona-*

pensis described lately in this Journal by Dr. Finsch, I am much indebted.

I commence with a brief review of the literature of the genus:—

1766. Linnæus, 'Systema Naturæ.'

But one species was known to this author belonging to the present genus, and was named by him *Columba viridis*. Species 1.

1788. Gmelin, 'Systema Naturæ.'

In this work three species are given, two of which are described the first time—*C. viridis*, *C. jambu*, and *C. melanocephalus*. Another one is mentioned, the *C. purpurata*, based on Latham's "Purple-crowned Pigeon." This, however, describes no species known, but is taken from portions of two different ones, and therefore cannot be recognized. Species 3.

1813. Temminck, 'Histoire Naturelle des Pigeons et des Gallinacées.'

Two species are here described belonging to the genus *Ptilopus*, viz. *Pt. cinctus* and *Pt. superbus*, placed in the genus *Columba*. Species 5.

1820–39. Temminck, 'Planches Coloriées.'

Eight species are described in this work belonging to this genus, all under the term *Columba*, seven of which are given for the first time, viz. *Pt. magnificus*, *Pt. monachus*, *Pt. pulchellus*, *Pt. hyogaster*, *Pt. porphyreus*, *Pt. perlatus*, and *Pt. nanus*. The *Pt. xanthogaster* of Wagl. is renamed *diademata*. Species 12.

1825. Swainson, 'Zoological Journal.'

Pt. regina, from Australia, described as *Columba purpurata*, var. *regina*. Species 13.

1826. Lesson, 'Voyage de la Coquille.'

In the volume devoted to the zoology of this expedition one species is described belonging to this genus, viz. *Pt. taitensis* as *Columba kurukuru*, var. *taitensis*, from Otaheite. Species 14.

1827. Lesson, 'Bulletin des Sciences Naturelles.'

The *Colombe amarante* of the 'Voyage of the Coquille' is here named *Columba puella*. Species 15.

1827. Wagler, 'Systema Avium.'

Pt. xanthogaster first described as *Columba xanthogaster*. Species 16.

1829. Wagler, in the 'Isis.'

In his list of the Columbæ several species of this genus are given. Two are described for the first time, viz. *Pt. pectoralis* and *Pt. purpuratus*, ex Tonga Tabou. *Pt. taitensis*, Less., is renamed *Columba oopa*. Species 18.

1830. Quoy & Gaimard, in the 'Voyage of the Astrolabe.'
Pt. gularis is here described and figured as *Columba gularis*. Species 19.

1831. Lesson, 'Traité d'Ornithologie.'
Under the term *Ptilonopus* eight species are given, one of them for the first time, *Pt. roseicapillus*. Four of the remainder are valid species, viz. *melanocephalus*, *jambu*, *porphyreus*, and *taitensis*. *Pt. cyanovirens* is the female of *superbus*, *Pt. virens* is the female of *pectoralis*, and *Pt. purpuratus* is *Pt. ewingii*. Species 20.

1838? Knip and Prévost, 'Histoire Naturelle Générale des Pigeons.'
Ptilopus rivoli described as *Columba rivoli*. Species 21.

1840. Neboux, in the 'Revue Zoologique.'
Pt. dupetit-thouarsi first described as *Columba dupetit-thouarsii*. Species 22.

1841. Hombron and Jacquinot, 'Annales des Sciences Naturelles.'
Pt. luteovirens described in the genus *Columba*. Species 23.

1842. Gould, in the 'Proceedings of the Zoological Society of London.'
Pt. ewingii described. Species 24.

1844. Gray and Mitchell, 'Genera of Birds.'
Twenty-five species are here recorded, of which three do not belong to this genus, viz. *Pt. holosericeus*, Temm., *maculatus*, Gmel., and *pulcherrimus*, Scop. *Pt. purpuratus*, Lath., is a made-up species, *Pt. virens*=*pectoralis*, Wagl.; *Pt. cyanovirens* = *superbus* ♀, Temm.; *Pt. purpureo-leucocephalus* = *dupetit-thouarsi*, Neboux; *Pt. swainsoni* = *regina*, Swains.; *Pt. roseicollis* = *porphyreus*, Temm.; *Pt. viridissimus*, Temm. = *fasciatus*, Peale. The remaining species are valid, among which *Pt. occipitalis* is given for the first time and a plate published. Species 25.

1848. Peale, 'United-States Exploring Expedition, Ornithology.'
A list of the species belonging to this group, collected by this Expedition, is given, four in all, among which three are described for the first time, viz. *Pt. coralensis*, *Pt. perousii*, and *Pt. fasciatus*; the fourth, *Pt. furcatus*, is the *Pt. taitensis* of Lesson. Species 28.

1850. Gould, in 'Jardine's Contributions to Ornithology.'
Pt. strophium described for the first time. Species 29.

1850. Gould, 'Proceedings of the Zoological Society of London.'
A race of *Pt. magnificus* is named *Pt. assimilis*. Species 30.

1853. Gray, 'Proceedings of the Zoological Society of London.'
Pt. chrysogaster described. Species 31.

1853. Jacquinot and Pucheran, 'Voyage au Pôle Sud' (text). Young of *Pt. luteovirens* described as *Pt. feliciæ*.

1854. Bonaparte, in the 'Comptes Rendus.'

In a paper contributed to this Journal, Bonaparte divided the then known species of *Ptilopus* into various genera as follows:—*Leucotreron, Cyanotreron, Rhamphiculus, Omeotreron, Kurutreron, Thouarsitreron, Lamprotreron, Iotreron,* and *Chrysœna*. These are founded mainly upon the coloration of plumage (a dangerous character (?) always), and in this case not particularly well selected. In the case of *Rhamphiculus* and *Omeotreron*, the former is created for the young (!), and the latter for the adult (!), of *Ptilopus occipitalis*; and in *Cyanotreron* is placed the female (?) of *Ptilopus superbus*, while the male (!) of the same species is made the type of the genus *Lamprotreron*. In *Omeotreron*, also, is placed the young of *Pt. luteovirens*, while the adult is the type of the genus *Chrysœna*! It does not appear to me necessary, or even advisable, to adopt any of this author's genera for this group.

1854. Bonaparte, in the 'Comptes Rendus.'

The young of *Pt. occipitalis* is called *Pt. batilda*, and *Pt. apicalis* is first described. Species 32.

1855. DesMurs and Prévost, 'Voyage de la Vénus.'

Pt. mercieri and *Pt. temminckii* first described. Species 34.

1855. Bonaparte, in the 'Comptes Rendus.'

Pt. leclancheri described as *Trerolæma leclancheri*. Species 35.

1856. Gray, 'List Birds British Museum.'

Among the members of this genus here recorded *Pt. greyi* is named but not described. Species 36.

1856. Gould, 'Proceedings of the Zoological Society of London.'

Pt. eugeniæ from the Solomon Islands described. Species 37.

1857. Bonaparte, 'Conspectus Generum Avium.'

In this publication this author made a subfamily of this group, and divided it into the genera proposed by him in the 'Comptes Rendus' three years previously. *Pt. xanthogaster*, Wagl., is called *diademata*, after Temminck, *Drepanoptila holosericea* is placed in the genus *Lamprotreron* with *superba* and *porphyreus*! In *Ptilopus* are *purpuratus*, Wagl., as *porphyraceus*, Forst., ex Tonga-Tabou; *regina*, Swains., as *swainsoni*, Gould; *Pt. ewingii*, Gould, from Timor, is separated as *flavicollis*, after Gray; *Pt. coralensis*, Peale, redescribed as *viridissimus*; the species ex Vanikoro (!) (errore) called *purpuratus*, Wagl. [this bird comes from Balaou, not Vanikoro, and was afterwards named *bonapartei* by Gray]; *Pt. roseicapillus, mercieri, fasciatus*, Peale (as *clementinæ*, Hombr. & Jacq.); *perousii*, Peale (as *mariæ*, Hombr. & Jacq.); *pulchellus* and *apicalis*. *Cyanotreron* has *cyanovirens* (= *superbus*, Temm., ♀) and *monachus*, Temm. *Iotreron* contains *viridis*, Linn., *melanocephalus*, Gmel., *rivoli*, Prév. & Knip, *iogaster*, Temm., and *nana*,

Temm. *Kurutreron* possesses *oopa*, Wagl. (=*taitensis*, Less.), *chrysogaster*, Gray, and *coralensis*, Peale. *Omeotreron* has *batilda* (=*occipitalis*, juv.), *virens* (=*pectoralis*, Wagl.), and *feliciæ*, Hombr. and Jacq. (=*luteovirens*, Hombr. & Jacq., juv.). In *Chrysœna* is placed *luteovirens*. *Phapitreron* is also included in this subfamily, containing the *Columba leucotis*, Temm., and *Ph. amethystina*, Bon.; but these birds have but little in common with those of the genus *Ptilopus*.

1858. GRAY, 'Proceedings of the Zoological Society of London.'
Five species are here described for the first time, viz. *Pt. prasinorrhous*, *Pt. iozonus*, *Pt. aurantiifrons*, *Pt. coronulatus*, and *Pt. wallacei*. Species 42.

1859. GRAY, 'List of Birds of the Tropical Islands of the Pacific Ocean.'
Nineteen species of the genus *Ptilopus* are recorded in this catalogue of the species of the Pacific islands contained in the British Museum. One species is described as distinct—*Pt. chalcurus*. Species 43.

1860. GRAY, 'Proceedings of the Zoological Society of London.'
Pt. temminckii, Des Murs & Prév., described as *Pt. formosus*.

1861. Schlegel, 'Nederlandsch Tijdschrift voor de Dierkunde.'
Pt. insolitus described. Species 44.

1862. WALLACE, 'Proceedings of the Zoological Society of London.'
Pt. humeralis first described. Species 45.

1863. WALLACE, 'Proceedings of the Zoological Society of London.'
Pt. albocinctus first named. Species 46.

1863. SCHLEGEL, 'Nederlandsch Tijdschrift voor de Dierkunde.'
Pt. bernsteini first described. Species 47.

1868. HARTLAUB AND FINSCH, 'Proceedings of the Zoological Society of London.'
Pt. pelewensis described. Species 48.

1867. FINSCH AND HARTLAUB, 'Fauna Centralpolynesiens.'
This standard work on the Central Polynesian avifauna contains all the species of this genus that were known at the time of its publication. *Pt. purpuratus*, Wagl., ex Tonga Tabou, is called *Pt. porphyraceus*, Forst.; *Pt. purpuratus*, Temm., is referred to *C. forsteri*, Desm.; and the genus *Chrysœna* is employed for *Pt. luteovirens*. *Drepanoptila holosericea* is also retained in the genus *Ptilopus*. No new species are described. Many of the species given had not been seen by the authors.

1870. GRAY, 'Hand-list of Birds.'
A list of the known species is here given, without any especial attempt to arrange their synonymy being made. The birds figured by Bonaparte on pl. xix. of his 'Iconographie des Pigeons' are named *Pt. bonapartii*. Species 49.

1871. Hartlaub and Finsch, in the 'Proceedings of the Zoological Society of London.'
Pt. rarotongensis described. Species 50.

1871. Schlegel, 'Nederlandsch Tijdschrift voor de Dierkunde.'
Three species are here described, viz. *Pt. speciosus*, *Pt. ornatus*, and *Pt. geelvinckianus*, the last as *Pt. viridis geelvinckianus*. Species 53.

1871. Gould, in the 'Proceedings of the Zoological Society of London.'
Pt. victor described. Species 54.

1873. Schlegel, 'Muséum des Pays-Bas.'
A catalogue is here given of the species contained in the Leyden Museum belonging to the genus *Ptilopus*. Some are included which should be separated into different genera, such as *Drepanoptila holosericea* and the members of *Funingus*. Three species are described as new—*Pt. neglectus*, *Pt. lettiensis* (called *Pt. cinctus lettiensis*), and *Pt. jobiensis* (called *Pt. humeralis jobiensis*). Species 57.

1873. Sclater, in the 'Proceedings of the Zoological Society of London.'
Pt. bellus described. Species 58.

1874. Finsch, in the 'Proceedings of the Zoological Society of London.'
Pt. huttoni described. Species 59.

1875. Salvadori, 'Annali del Museo Civico Naturale di Genova.'
In different lists of birds inhabiting New Guinea, six species of *Ptilopus* are described, viz. *Pt. gestroi*, *Pt. melanospilus*, *Pt. chrysorrhous*, *Pt. xanthorrhous*, *Pt. geminus*, and *Pt. trigeminus*. Species 65.

1875. Layard, in the 'Proceedings of the Zoological Society of London.'
Pt. viridis, as *Chryscenas viridis*, described. This is the *Pt. layardi* of the present paper. The name *viridis*, having been given by Linnæus to another species of *Ptilopus*, cannot stand. Species 66.

1876. Salvadori, 'Annali del Museo Civico Naturale di Genova.'
Pt. zonurus described. Species 67.

1876. Ramsay, in the 'Proceedings of the Linnean Society of New South Wales.'
Pt. corriei described. Species 68.

1876. Brüggemann, 'Abhandlungen des naturwissenschaftlichen Vereins zu Bremen.'
Pt. fischeri described. Species 69.

1877. Sclater, in the 'Proceedings of the Zoological Society of London.'
Pt. johannis described. Species 70.

1877. FINSCH, in the 'Proceedings of the Zoological Society of London.'

Pt. fasciatus, Peale, described as *Pt. ponapensis*.

1878. D. G. ELLIOT, 'Annals and Magazine of Natural History.'

Pt. pictiventris described. Species 71.

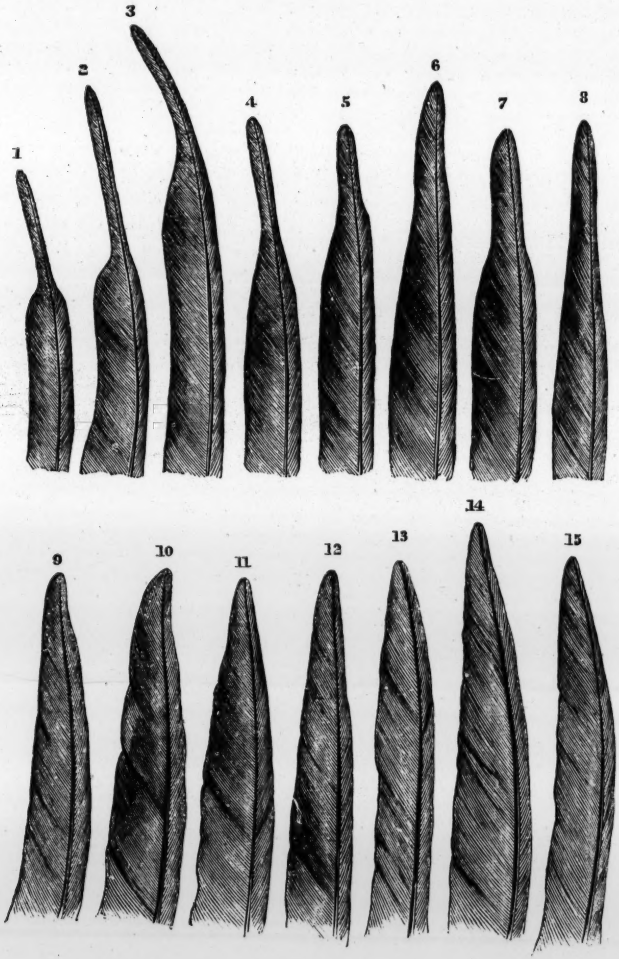
As the term "*purpuratus*" has been applied to so many different species by authors, it occurs to me that it may be useful if I give a list of these, referring each one to the species for which it was intended. For the reasons given in the article on *Pt. purpuratus* of this paper, I accept for this term the species so designated in 1829 by Wagler, considering that the *purpuratus* of Gmelin should be rejected from the nomenclature of the group as not representing any known species, but one formed from the characters possessed by two distinct ones.

(1813) *Columba purpurata* (prem. var.), Temm. Pig. & Gall. tom. i. p. 282 ..... = *Pt. regina*, Swains.
(1813) „ „ Temm. Pig. & Gall. tom. i. p. 280 = *Pt. ewingii*, Gould.
(1821–34) „ „ Jard. & Selby, Illustr. Zool. vol. ii. pl. 70 ..... = *Pt. regina*, Swains.
(1824) „ „ Temm. Plan. Col. livr. 43 ..... = *Pt. xanthogaster*, Wagl.
(1826) *Ptilonopus purpuratus*, Steph. Cont. Shaw Gen. Zool. vol. xiv. p. 277..... = *Pt. xanthogaster*, Wagl.
(1829) *Columba purpurata*, Wagl. Isis, p. 742 ..... = *Pt. purpuratus*, ex Tonga.
(1835) *Pilinopus purpuratus*, Selby, Nat. Libr. vol. v. p. 103, pl. 3 ..... = *Pt. ewingii*, Gould.
(1844) *Ptilonopus purpuratus*, Gray, List Birds Brit. Mus. p. 2, *Gall.* ..... = *Pt. ewingii*, Gould.
(1855) *Kurukuru purpuratus*, Des Murs & Prév. Voy. Vénus, Zool. p. 222 ..... = *Pt. taitensis*, Less.
(1857) *Ptilopus purpuratus*, Bon. Consp. Gen. Av. vol. ii. p. 19 ..... = *Pt. greyi*, Gray.
(1857) „ „ Bon. Iconogr. Pig. pl. xix. adult. = *Pt. bonapartei*, Gray.
(1857) „ „ „ „ „ juv. . = *Pt. purpuratus*, Wagl.
(1858) *Ptilonopus purpuratus*, Cass. U.S. Expl. Exped. Ornith. pl. 30. p. 269 ... = *Pt. taitensis*, Less.
(1859) „ „ Gray, List Birds of the Trop. Isl. ..... = *Pt. taitensis*, Less.
(1867) *Ptilinopus purpuratus*, Finsch & Hartl. Faun. Centralpolyn. p. 122 ..... = *Pt. taitensis*, Less.
(1873) *Ptilopus purpuratus*, Schleg. Mus. Pays-B. p. 15 ... = *Pt. taitensis*, Less.

GENERA.

Quite a number of genera have been proposed for these birds; but only one is necessary. The term *Ptilopus* was given to them by Swainson in 1825, its derivation being πτίλον, πούς. Swainson wrote it *Ptilonopus*, which was afterwards corrected by Strickland in 1841. Various ways of spelling the name of this genus have been adopted, viz. *Ptilonopus*, *Ptilinopus*, *Ptinilopus*!, all of which are incorrect, and should not be used. *Ptilopus* is an artificial genus, by which I mean to express that the birds placed together in it do not possess any characters common to them all, either of form, structure, or coloration, which will serve to distinguish them from other groups

Fig. 1.



1. *Pt. purpuratus.*
2. *Pt. chrysogaster.*
3. *Pt. mercieri.*
4. *Pt. dupetithouarsii.*
5. *Pt. johiensis.*
6. *Pt. xanthorrhous.*
7. *Pt. insolitus.*
8. *Pt. taitensis.*
9. *Pt. aurantiifrons.*
10. *Pt. luteovirens.*
11. *Pt. lettiensis.*
12. *Pt. ornatus.*
13. *Pt. pectoralis.*
14. *Pt. bellus.*
15. *Pt. victor.*

in the family. Some authors have separated them from the rest of the Pigeons on account of the abruptly attenuated first primary. This is utterly worthless, either as a generic or a specific character, as among the species which are included in *Ptilopus* every gradation of the first primary is procurable, from the most abrupt attenuation to the normal shape of feather.

I here give (fig. 1), in proof of this assertion, a series of drawings of first primaries, together with the name of the species to which each belongs, so that any one can verify it for himself; and I may state that it would not have been at all difficult to have arranged a more minute gradation from the species at my disposal if it had been necessary; but those given will be found, I think, amply sufficient for the purpose.

Another so-called character, which has been adopted by some to distinguish the members of the genus *Ptilopus*, and one which is expressed by the term itself, is the *tarsus feathered to the foot*. This proves to be of no more value, generically or specifically, than the attenuated primary. Species with or without the last-named character have the tarsus covered or partly bare, as do also those with the graduated or normal shape of this feather. The drawings (pp. 510, 511) of the partly bare and partly covered tarsus, together with the first primary of several species, will show clearly how very unsatisfactory these characters are.

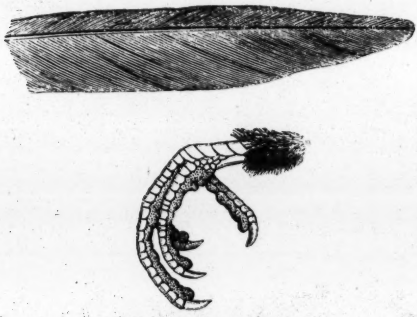
Relative lengths of wing and tail, as given by some writers for the separation of some of these birds into different genera, also are not constant, as the tail can be found shorter than the wing, or nearly equal to it in length. This last is the main character given by Reichenbach for separating the birds placed by him in his genus *Megaloprepia*, as all the others are common to different species of *Ptilopus*. He says:—"Schwanz fast so lang wie die Flügel. Vorderschwinge nicht verschmälert." The species included by him, it is true, have not this last character; but *Pt. perlatus* has the tail only a little over half the length of the wing, while *Pt. cinctus* and *Pt. gularis*, neither of which are included in *Megaloprepia*, have the *tail nearly as long as the wing*, with the first primary *abruptly attenuated*. I do not see that there is a single character remaining among those given by Reichenbach which can distinguish the birds included in his genus from those of the genus *Ptilopus*.

For those who deem colour sufficient to establish a genus, it might be supposed that among these gaily plumaged birds certain patterns might be found which would answer for a generic character. But this, again, fails; for the variety of the coloration is so great that it would be necessary to divide the group into numerous genera (as has, indeed, been attempted), and many of the species would be left alone to represent a genus. I do not find any thing better to designate the genus than the following formula:—*Ptilopus*. Size moderate; wings usually reaching two thirds the length of the tail; rectrices fourteen in number, excepting *Pt. occipitalis*, which has apparently sixteen; tarsi partly or wholly covered with feathers; colours of plumage usually bright, and often strongly

opposed: distinguished from *Treron* (with which it constitutes the subfamily *Treroninæ*) by not possessing the scallop on the inner web of the third primary.

Ptilopus is well placed between *Treron* and *Carpophaga*, leading

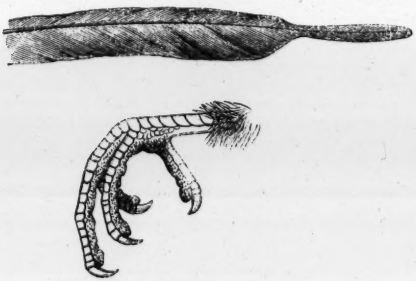
Fig. 2.



Ptilopus iogaster. Celebes.

First primary only narrowing slightly; tarsus partly bare.

Fig. 3.



Ptilopus fasciatus. Upolu, Samoa.

First primary abruptly attenuated; tarsus partly bare.

up to the latter genus through the different races of *Ptilopus magnificus*. It is the absence of the scallop on the third primary which is the chief distinction between *Ptilopus* and *Treron*. To any one who will study this group with ample materials, such as has fortunately been at my disposal, I think the difficulty, nay, impossibility, of discovering any trenchant generic characters will be readily acknowledged. Those who have had but a few species before them, represented by two or three individuals of each, might easily imagine that some one character of those which I have mentioned is really

of generic value; and it is only when a great series has been obtained that it is perceived how these gradually disappear or become evolved into something quite different. It is from the lack of material to show this fact that such a genus (among others) as *Chrysœna* has been accepted for *Pt. victor* and *Pt. luteovirens*. First established for the latter species, chiefly on account of the lanceolate form of the feathers, it was quickly perceived, on the discovery of *Pt. victor*, that the genus could not rest on this character; for the two species

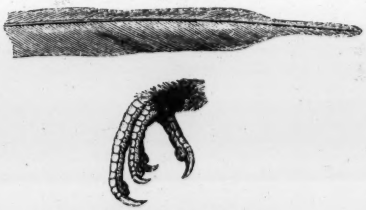
Fig 4.



Ptilopus geelvinckianus. Mafor.

First primary normal in shape; tarsus completely feathered.

Fig. 5.



Ptilopus coronulatus. Aru.

First primary abruptly attenuated; tarsus completely feathered.

were generically essentially the same, and yet *Pt. victor* did not possess lanceolate feathers. The partly covered tarsus is not sufficient to separate them from *Ptilopus*; for, as I have shown, many species of that genus have also the tarsus half nude. The normal shape of the first primary also fails, as this is also possessed by other species of *Ptilopus*; and therefore no characters remain worthy of separating these birds generically from the other members of the group, those that exist being only of specific value. Bonaparte has proposed most of the generic divisions; and he founded them mainly upon the colour of plumage, sometimes placing the two sexes, or adult and young, of the same species in different genera (vide *Pt. superbus*, *Pt. luteovirens*, &c.). I have not been able to discover

any reasons (after a careful examination of the species separated generically by him) for accepting his divisions. The species named by Schlegel *Pt. insolitus* has been made the type of a genus, *Œdirhinus*, by Cabanis and Reichenow. The same peculiarity exhibited by this bird—a bony protuberance upon the base of the culmen—is also found in certain members of the genus *Carpophaga*; and I see no more reason for separating *Pt. insolitus* from the other members of this genus than exists for placing these *Carpophagæ* in a new generic division. The term *Megaloprepia*, instituted by Reichenbach for certain birds of this group, was so oddly selected, at least in one instance (*Pt. perlatus*) that a doubt arises in my mind if the author had ever had an opportunity of examining specimens. No characters were given by him which were not also to be found in other species of *Ptilopus*; and although the term has been employed by some authors, it seems to me to be entirely unnecessary; for it is impossible to designate in a large series of *Ptilopi* where the genus (?) should commence, as the species graduate into one another from the smallest to the largest.

Prof. Garrod, in the 'Proceedings' of this Society for 1874, in his paper on the "Anatomy of the Columbæ," states that the members of the genus *Ptilopus* possess a form of gizzard such *as is not found in any other bird*, and gives figures exhibiting its peculiarities as compared with *Treron*. If this is ascertained to be a constant formation in *all* the species of *Ptilopus*, it may well be deemed of sufficient importance to constitute a generic character; but, unfortunately, as yet, it cannot be said to be proven; for out of the seventy-one species considered in this memoir as belonging to *Ptilopus*, Prof. Garrod has only been able to dissect *three*, a number too insignificant for it to be decided that all the members of the genus have the same formation. The *Carpophagæ* do not possess a similar gizzard; yet certain species of *Ptilopus*, viz. *Pt. magnificus* with its races *assimilis* and *puella*, and *Pt. gularis*, in their outward form resemble certain species of *Carpophaga*; and it is possible that in some of these at least a modified form of gizzard may be found to exist. It will be interesting to learn if such be the case, or if really the species of *Ptilopus* are separated from all other Pigeons by an abrupt alteration in the gizzard's shape, one not approached by that of any other bird. A large number of species must be first examined before this can be definitively ascertained.

The following are the principal generic terms which have been proposed for these birds.

		Type.
(1825)	*Ptilonopus*, err. Swains. Zool. Journ. vol. i. p. 473	*Pt. reginæ.*
(1841)	*Ptilopus*, corr. Strickl. Ann. Nat. Hist. vii. p. 36.	
(1854)	*Leucotreron*, Bon. Compt. Rend. vol. xxxix. p. 876	*Pt. cinctus.*
(1854)	*Cyanotreron*, Bon. tom. cit. p. 878	*Pt. monachus.*
(1854)	*Rhamphiculus*, Bon. ibid.	*Pt. occipitalis.*
(1854)	*Omeotreron*, Bon. ibid.	*Pt. occipitalis.*
(1854)	*Kurutreron*, Bon. ibid.	*Pt. purpuratus.*
(1854)	*Chrysœna*, Bon. ibid.	*Pt. luteovirens.*
(1854)	*Thouarsitreron*, Bon. tom. cit. p. 876	*Pt. dupetit-thouarsii.*
(1854)	*Lamprotreron*, Bon. ibid.	*Pt. superba.*

		Type.
(1854)	*Iotreron*, Bon. tom. cit. p. 878	*Pt. iogaster.*
(1857)	*Sylphitreron*, Verr. teste Bon. Consp. ii. p. 40 ...	*Pt. perlatus.*
(1862)	*Megoloprepia*, Reich. Tauben	*Pt. magnificus.*
(1876)	*Œdirhinus*, Cab. & Reich. J. f. Orn. p. 326	*Pt. insolitus.*

The *Drepanoptila holosericea*, from New Caledonia, has usually been placed in the genus *Ptilopus*; but it does not appear to me that this is its proper position. With a colouring, it is true, approaching something the style of these birds, it differs from them in form, and especially in the shape of the wing-feathers. These (see fig. 6) are very peculiar, and, in my opinion, at once remove this species from

Fig. 6.



Wing of *Drepanoptila holosericea*.

among the present group of birds into a separate genus. The drawing will show, better than any description can explain, the unusual formation of the feathers in question[1].

The members of the genus *Funingus*, beyond the feathered tarsus,

[1] In the Rev. et Mag. de Zool. 1862, p. 135, pl. 8, MM. J. Verreaux and O. Des Murs conferred another generic name upon this bird, viz., *Calyptomenœnas*, and gave a drawing of both it and a portion of the wing. Neither of these, however, are correctly done, especially that of the wing, which shows only the ends of the primaries. The illustration here given more faithfully exhibits the peculiar shape of these feathers.

have but little in common with the members of *Ptilopus*, the peculiarly notched first primary and bare face easily distinguishing them.

Geographical Distribution.

Probably no group in ornithology exhibits to a greater degree the effects upon the coloration of plumage arising from the physical causes incidental to an insular life than the one here considered as composing the genus *Ptilopus*. Some of these birds that have evidently had a common origin exhibit greater or less variations from each other, according to the position of their various habitats, sometimes of sufficient importance to constitute their possessors distinct species, at others only of that trivial kind that would at best but cause them to rank merely as varieties, the lapse of time during which the individuals have dwelt in their separate localities not having been sufficiently great, or the physical causes of climate, food, and soil not powerful enough to modify essentially their appearance from the typical form. It is therefore not surprising that we find some species inhabiting one island only, others dwelling upon several, though perhaps separated by miles of sea, while again in other localities uncertain forms are observed not changed sufficiently to authorize the bestowal upon them of a separate distinctive rank, but yet differing enough to show that a departure from the type and towards a distinctive independent form has been commenced, and will continue (unless the race should become exterminated) until the variety eventually blooms into a separate species possessing characters not found elsewhere. It is not to be supposed that the continents of which the islands of the Pacific and those of the Eastern Archipelago are the sole remains, were broken up simultaneously or always suddenly throughout their length and breadth; but more probably the casualty happened at various periods and sometimes gradually. Therefore we may not be surprised at the apparently strange phenomenon that one species should inhabit various islands, between which are others containing totally distinct forms of the same genus. This may have been brought about in two probable ways. A species may have been widely dispersed over the continent; and when portions of this had disappeared beneath the waves, the fragments that remained above water at the outset were all occupied by the same species: but physical effects at intermediate points were of a different character from those at the extremes; and in course of time the birds dwelling on the intervening islands departed entirely from their types, while those most widely separated retained their original characters. Or it may, on the other hand, have been that on the breaking-up of the continent a district inhabited by a strictly local species (but one surrounded by a more widely disseminated and distinct species) had not been entirely submerged; and this, all other circumstances being equal, would explain the fact that a distinct form should intrude itself on an island lying between others inhabited by a different one, the species with the greater range having been preserved at the extremes

of its habitat, which also had become islands. In considering the peculiarities of the geographical distribution of these birds, the great physical changes that have taken place in that portion of the globe over which they are dispersed must always be borne in mind.

The members of the genus *Ptilopus* are found in only two of the zoogeographical regions of the earth, viz. the Oriental and Australian. Of these the latter contains by far the great majority of the species; and, to judge from the material at present available, the Papuan group of the Austro-Malayan Subregion is apparently the head quarters of the genus. The Polynesian Subregion also possesses many species; but they are altogether of a different style of plumage, and constitute almost a division by themselves.

I commence the review of this portion of my subject with the most easterly group of the Pacific islands (in the Polynesian Subregion of the Australian Region) in which any members of this genus are found, viz. the Marquesas. But two species are met with among these islands—the *Pt. dupetit-thouarsii*, on Christine Island, and the *Pt. mercieri*, from Nuka-hiva. Both of these are very distinct from all others known. I have described *Pt. pictiventris* as from Nuka-hiva of the Marquesas; but, for the reasons I give under the head of this species, I believe that locality to be an error, and that the bird in question is a native of the Samoan Islands only. To the south-west of the Marquesas lies the Pomatu archipelago, which is as yet hardly known in an ornithological sense. But one species of *Ptilopus* has been recorded from there, *Pt. coralensis*, found on Carlshoff Island. South of the Pomatu group lies the island of Rapa. Here has been procured probably the most important member of this genus, *Pt. huttoni*. To the west of Pomatu are the Society Islands, upon only two of which have any species of *Ptilopus* been procured, viz. *P. chrysogaster*, upon Huahaine, and *Pt. taitensis* in Otaheite. To the south-west of this last is Cook's Archipelago, where *Pt. chalcurus* has been obtained on Harvey Island. It is still doubtful if this bird is specifically distinct from *Pt. coralensis* of the Pomatu group. If the identity of those two could be established, it would be an interesting and important fact, since the two clusters of islands are not only separated by miles of ocean, but several distinct forms of *Ptilopus* are found upon the intervening archipelagos, none of which, so far as we know, are particularly related to *Pt. chalcurus*. Upon Rarotonga island has been procured *Pt. rarotongensis*; and these two species are all that have as yet been found in this group. Savage Island, lying between Cook's Archipelago and the Friendly group, contains three species—*Pt. purpuratus*, *Pt. pictiventris* and *Pt. rarotongensis*. Passing on to the westward we reach the Tonga Islands, among which five species of *Ptilopus* dwell, a number exceeded in only one of the Pacific groups, viz. the Fijis. On Tonga-Tabou all the species occur—*Pt. chrysogaster*, *Pt. apicalis*, *Pt. pictiventris*, *Pt. purpuratus*, and *Pt. perousii*. Harpai contains *Pt. perousii* and *Pt. purpuratus*; and this last has also been procured at Eua and Ninafou, the last the most northern of them all. North of the

Friendly Islands lie the Samoan or Navigators' Islands. These contain also five species, two of which are not met with in the Tonga Group. Opalu has four—*Pt. perousii*, *Pt. luteovirens*. *Pt. pictiventris*, and *Pt. fasciatus*, this last being also found on Wallis Island, while *Pt. purpuratus* is a native of Fulima, lying to the south of Wallis. We now come to the Fijis, which possess among the different islands nine species of *Ptilopus*. Only one island, however, contains more than two species, viz. Viti-Levu, which has three—*Pt. perousii*, *Pt. luteovirens*, and *Pt. pictiventris*. Schlegel suggests Viti as the probable locality also of the bird he has called *Pt. neglectus*; but this is very uncertain, and there is no evidence to support the supposition. Balaou has two species—*Pt. luteovirens* and *Pt. bonapartei*. Two species are found upon five islands which possess no others of this genus. These are *Pt. perousii* and *Pt. purpuratus*, met with at Waikia, Vanua Levu, Mango, Mokani, and Loma Loma. Bua, Lanthala and Ngamia only have *Pt. victor*. Taviuni has *Pt. victor* and *Pt. purpuratus*; while Kandavu contains *Pt. perousii* and *Pt. layardi*. The New Hebrides possess but two species—*Pt. greyi* on Erromango Island, and *Pt. corriei* on Malacolo. On Lifu, of the Loyalty group, *Pt. greyi* is found, as well as on the Isle of Pines and New Caledonia to the west, this last being also recorded by Schlegel as the habitat of *Pt. insolitus*—which, however, is probably an error. Passing now to the northward, *Pt. greyi* is again met with on Vanikoro of the Santa-Cruz archipelago; and in the Caroline archipelago, on the island of Ponapé in the Seniavin group, *Pt. fasciatus* has been procured. To the north-west, the furthest north perhaps that any species of this genus is found, lie the Marianne or Ladrone Islands. Here is met with the very distinct *Pt. roseicapillus*, the only representative of these birds in this group. To the west are the Pelew Islands, whence comes *Pt. pelewensis*; but from which particular island is not stated by its describers.

We now reach the Austro-Malayan Subregion; and the islands which come first in this review (proceeding from the east towards the west) are those contained in the Papuan group, of which New Guinea is the centre and most important. Beginning with the most eastern division of this group, we have first the Solomon Islands, upon one of which, not as yet known, the *Pt. eugeniæ* was obtained. To the westward of this, in the Louisiade archipelago, on the Island of Duchateau, the type of *Pt. strophium* was procured. From New Ireland, to the north-west, come *Pt. insolitus* and *Pt. puella*; while between this last-named island and New Britain lies Duke-of-York Island, the home of the rare and little-known *Pt. rivolii* and also of the *Pt. insolitus* mentioned above. From New Hanover *Pt. superbus* has been received. To the north-west of this section, on Wild and D'Entrecasteaux Islands of the Admiralty group, the beautiful *Pt. johannis* was obtained by the naturalists of the 'Challenger' Expedition. Coming now to New Guinea, the islands in the great Bay of Geelvinck claim our attention. Krudu, the most eastern of these, possesses one species, *Pt. geminus*. Next, on the large

island of Jobie, eight species of this genus dwell, viz. *Pt. superbus*, *Pt. coronulatus*, *Pt. geminus*, *Pt. aurantiifrons*, *Pt. perlatus*, *Pt. strophium*, *Pt. puella*, and *Pt. jobiensis*. The small island of Ansus, to the south of Jobie, contains also one species, *Pt. geminus*, being the only one out of those found upon its great neighbour. Meosnoum or Misnomin, to the west of Jobie, also contains one species found on that island, *Pt. strophium*. On the island of Korido, or Sook, the most northern of those in this bay, two species have been procured, *Pt. pectoralis* and *Pt. speciosus*. Mansinam, the last island in this bay from which any species of *Ptilopus* is known to come, contains one species, the *Pt. humeralis*. It will thus be seen that, so far as we are able to determine from our material, in the Bay of Geelvinck, Jobie is the central or starting-point of the members of this genus. The two small islands lying near are only detached portions of Jobie, each containing one species found on the last, but none peculiar to themselves. On the other hand the islands of Korido and Mafor only have one species in common with Jobie, viz. *Pt. superbus*, found on Korido, while on Mafor *Pt. pectoralis* and *Pt. geelvinkianus* are met with, the last-named being also a native of Meosnoum. The relationship of these islands, so far as regards this genus, are nearer to the western shores of the bay than to Jobie. Turning now to the mainland, at Andai and Dorey five species are found—*Pt. pulchellus*, *Pt. pectoralis*, *Pt. puella*, *Pt. geminus*, and *Pt. perlatus*; while on Mount Arfak *Pt. superbus*, *Pt. bellus*, *Pt. iozonus*, *Pt. aurantiifrons*, and *Pt. ornatus* have been obtained. At Amberbaki, on the north coast, five species have been procured, viz. *Pt. pulchellus*, *Pt. superbus*, *Pt. perlatus*, *Pt. pectoralis*, and *Pt. bellus*; while at Sorong *Pt. trigeminus*, *Pt. humeralis*, *Pt. coronulatus*, and *Pt. prasinorrhous* have been met with. At Triton Bay *Pt. nanus* has been obtained; and at Mount Epa, in the south of New Guinea, the small race of *Pt. magnificus*, called *puella*, is found. These are all that are as yet known to come from the mainland of New Guinea; but doubtless others of the described species, as well as those not yet discovered, remain to be obtained among the dense forests of this singular country. Passing now to the western islands of the Papuan group, the most northerly is Waigiou, which contains five species—*Pt. superbus*, *Pt. pulchellus*, *Pt. prasinorrhous*, *Pt. puella*, and *Pt. pectoralis*, this last being also found upon the near-lying small islands of Gagie and Giebeh, while *Pt. puella* is also met with on Ghémien. Batanta has four, viz. *Pt. aurantiifrons*, *Pt. superbus*, *Pt. pectoralis*, and *Pt. prasinorrhous*; while Salwatty possesses all these (excepting *Pt. pectoralis*) and also *Pt. coronulatus*, *Pt. trigeminus*, *Pt. humeralis*, *Pt. pulchellus*, *Pt. perlatus*, and *Pt. puella*. Mysol, to the south-west of Salwatty, contains seven species, viz. *Pt. prasinorrhous*, *Pt. superbus*, *Pt. aurantiifrons*, *Pt. pulchellus*, *Pt. puella*, *Pt. pectoralis*, and *Pt. nanus*. All of these save the last two are found upon Salwatty. Far to the south of this last-named island we reach the most southern ones of the group, viz. Arou, with seven species (*Pt. coronulatus*, *Pt. superbus*, *Pt. iozonus*,

Pt. wallacei. *Pt. aurantiifrons*, *Pt. zonurus*, and *Pt. perlatus*), and Yule Island, lying to the south-east of the mouth of Fly River, in the Papuan Gulf, and close to the coast, with two (*Pt. coronulatus* and *Pt. gestroi*, the last intermediate between *Pt. ornatus* and *Pt. perlatus*). The next group of the Austro-Malayan Islands that claims our attention is the Moluccas; and, commencing with the furthest north, Sanghir is the first to be considered: here is found a race of *Pt. melanocephalus* from Java, which has become possessed of sufficient characteristics to separate it from the type, and is known as *Pt. xanthorrhous*. Gilolo and its small neighbours, Ternate and Batchian, contain four species, found on each, viz. *Pt. iogaster*, *Pt. superbus*, *Pt. bernsteini*, and *Pt. monachus*. Tidore, on the west, has three—*Pt. monachus*, *Pt. iogaster*, and *Pt. prasinorrhous*; Morty two, *Pt. monachus* and *Pt. iogaster*; Obi one, *Pt. bernsteini*; Dammor and Kaisa, each one, *Pt. monachus*; and Weda and Dodingo also one, *Pt. iogaster*. Ceram contains three species—*Pt. chrysorrhous*, *Pt. superbus*, and *Pt. viridis*, this last being also found upon the small island of Monavolka, which, together with Matabello, also possesses *Pt. prasinorrhous*. Banda, to the south of Ceram, has *Pt. xanthogaster*, which is also found upon the islands of Khoor and Ki, these last having in addition *Pt. prasinorrhous*. Goram, lying to the east, has two species, the one last named and *Pt. viridis*. Bouru has three species—*Pt. superbus*, *Pt. viridis*, and *Pt. prasinorrhous*; while Amboyna has also three species—*Pt. superbus*, *Pt. viridis*, and *Pt. prasinorrhous*; and Harouka, east of Amboyna, contains *Pt. viridis*. Of the Timor group, I commence with Timor, which possesses two species, *P. ewingii* and *Pt. cinctus*, this last being also found upon the small island of Wetta, to the north of Timor; while Lettie, to the north-east, possesses *Pt. lettiensis* (a modification of *Pt. cinctus*) and *Pt. xanthogaster*. Flores has three species—*Pt. ewingii*, *Pt. albocinctus*, and *Pt. melanocephalus*, this last being also found in Sambawa and Lombock. Celebes has four species, three of which are peculiar to it, viz. *Pt. melanospilus*, *Pt. temminckii*, *Pt. gularis*, and *Pt. fischeri*; while Sula contains *Pt. melanospilus* and *Pt. chrysorrhous*. Australia, the last division of this region, has six species—*Pt. regina* and *Pt. magnificus* in New South Wales, in the district between the river Hunter and Moreton Bay, *Pt. superbus* at Cape York and on the Booby Islands, *Pt. assimilis* and *Pt. magnificus* in North-east Queensland at Rockingham Bay, *Pt. assimilis* being also found together with *Pt. puella* at Cape York, and *Pt. ewingii* on the Coburg Peninsula near the coast—the distribution of the three forms of *Pt. magnificus* being decidedly against the view that they represent distinct species.

The other zoogeographical region in which these birds are found is the Oriental; and we here find them restricted to the subregion containing the Indo-Malay islands. Of these I commence with the Philippine group, in only one island of which as yet has any species been found, viz. Luzon, containing three (*Pt. occipitalis*, *Pt. jambu*, and *Pt. leclancheri*). The great island of Borneo, and also Sumatra,

have but one species, *Pt. jambu*; while Java, the last locality in which *Ptilopus* is found, contains two, *Pt. melanocephalus* and *Pt. porphyreus*.

The following key will show the chief differences existing between the birds of this genus. I recognize 71 species, and have divided them into two great groups, characterized by having the breast-feathers bifurcate or not bifurcate.

KEY TO THE SPECIES.

A. Breast-feathers bifurcate.

a. Front and top of head purple or deep rose, margined with yellow or pale green.

a'. Tail with a subterminal grey or ash-coloured band.

a''. Abdomen deep rose-colour; under tail-coverts yellow, tipped with rose; breast bright green ..... 1. *Pt. greyi*, p. 523.

b''. Abdomen and breast washed with olive; purplish red spot on the breast 2. *Pt. neglectus*, p. 524.

c''. Abdomen and flanks green, with an indistinct spot of darker green in the middle of the former; breast ash-colour, tinged with green; back, wings, and tail green, with strong coppery red reflexions; inner secondaries with a small dark green spot on tip ..... 3. *Pt. bonapartei*, p. 524.

d''. Abdomen pale green, with a purplish black spot in the centre; breast uniform ashy, tinged with green; scapulars with a conspicuous dark violet spot at tip ..... 4. *Pt. purpuratus*, p. 525.

b'. Tail with a terminal yellow band.

a''. No spot at base of mandible.

1. Centre of abdomen rufous ..... 5. *Pt. apicalis*, p. 527.
2. Secondaries and tail copper-colour; small dark purple spot on lower part of abdomen.
   a. Front and crown purple ..... 6. *Pt. coralensis*, p. 528.
   β. Front and crown greyish purple or amethyst ..... 7. *Pt. chalcurus*, p. 529.
3. Middle of abdomen rufous, upper edge dark purple, scapulars tipped with lilac ..... 8. *Pt. pictiventris*, p. 530.
4. Feathers on upper part of breast with transverse violet spots near the tips; no spot on lower part of breast; abdomen orange; crissum yellow; under tail-coverts white at base, then yellow, with rose-violet tips ..... 9. *Pt. pelewensis*, p. 531.
5. Throat white or pale yellow; breast pale green, feathers tipped with light grey; abdomen orange, with a lilac-red spot in the centre ..... 10. *Pt. regina*, p. 531.
6. Throat light yellow; breast pale green, feathers tipped with light grey; abdomen orange, with a pale lilac band upon the upper part ... 11. *Pt. ewingii*, p. 533.

7. Abdomen and under tail-coverts bright yellow; on lower part of breast a large spot of dark purplish red ..... 12. *Pt. rarotongensis*, p. 534.
8. Throat, cheeks, and breast yellowish green; abdomen clear green, with a purplish black spot in the centre 13. *Pt. fasciatus*, p. 535.

b''. Conspicuous deep-rose spot at base of mandible.
1. Abdomen bright uniform yellowish green, without spot ..... 14. *Pt. mercieri*, p. 536.
2. Breast with a deep purple spot on lower part; abdomen orange; under tail-coverts bright yellow, tips orange ..... 15. *Pt. roseicapillus*, 537.
3. Chin pale purplish red; dark purplish violet spot on breast, with the base of the feathers dark olive-green; under tail-coverts purplish violet-red, basal portion yellow; purplish violet of front and crown surrounded by green..... 16. *Pt. huttoni*, p. 538.

b. Front and top of head greyish or purplish white, margined with yellow.
a'. Abdomen deep rose; crissum and under tail-coverts deep yellow ..... 17. *Pt. dupetithouarsi*, p. 539.
b'. Abdomen and under tail-coverts orange-yellow ..... 18. *Pt. xanthogaster*, p. 540.
c' Abdomen and under tail-coverts bright yellow ..... 19. *Pt. chrysogaster*, p. 541.
d'. Underparts pale ash-green; centre of abdomen and crissum pale yellow; under tail-coverts bright yellow ..... 20. *Pt. taitensis*, p. 541.

c. Top of head and occiput bright purple; sides of head light green; nape and sides of neck rufous-orange; middle of abdomen and crissum white: flanks and thighs green.
a'. Feathers of breast purple at base, broadly tipped with ashy grey, a broad bluish black band across the lower part of breast 21. *Pt. superbus*, p. 542.
b'. Lower part of breast light purple, graduating into bluish black ..... 22. *Pt. temminckii*, p. 544.

d. Front, crown, band across the back, and under tail-coverts dark purplish red; feathers of breast purple at base, white at tip; beneath these an orange band ..... 23. *Pt. perousei*, p. 545.

e. Front pink, with posteriorly a narrow band of purple, followed by a broader one of yellow; a purple spot on fore part of abdomen; middle of abdomen and under tail-coverts yellow ..... 24. *Pt. coronulatus*, p. 546.

f. Front pinkish white, surrounded by a purple band succeeded by one of yellow; purple spot on abdomen, surrounded by saffron-yellow ..... 25. *Pt. geminus*, p. 546.

g. Front greyish white ..... 26. *Pt. trigeminus*, p. 547.

B. Breast-feathers not bifurcate.

a. Middle of abdomen deep orange; vent and under tail-coverts white varied with yellow; tertials violet grey in the centre.
a'. Shoulders greyish violet, mixed with

green; tail green, with an apical grey band above, white beneath ..... 27. *Pt. iozonus*, p. 547.

b' Shoulders violet-grey, bordered beneath by deep purple; tail green, with a subterminal grey band on lower surface only 28. *Pt. humeralis*, p. 548.

c'. Shoulders violet-grey; tail green above, beneath black, with an apical white band 29. *Pt. jobiensis*, p. 548.

d'. Bony protuberance on forehead; shoulders and patch on back light grey; tail bright green, apical third ashy grey 30. *Pt. insolitus*, p. 549.

b. Bluish grey band on each side of breast; purple spot on centre of abdomen; wing-coverts, scapulars, and tertials tipped with yellow ..... 31. *Pt. nanus*, p. 549.

c. Front, crown and lores, moustaches, and spot on the breast greyish blue; superciliary stripe, chin, throat, lower parts of abdomen, and under tail-coverts lemon-yellow 32. *Pt. monachus*, p. 550.

d. Front and crown bright carmine; sides of head and neck and breast light grey; chin and throat white; large purplish red spot on lower part of breast; abdomen and under tail-coverts orange ..... 33. *Pt. pulchellus*, p. 551.

e. Head and neck light grey; occiput and back of neck black; throat yellow.

a'. Crissum and short under tail-coverts yellow, long ones carmine ..... 34. *Pt. melanocephalus*, p. 551.

b'. Throat-mark narrow; crissum yellow, washed with orange ..... 35. *Pt. melanospilus*, p. 552.

c'. Throat-mark narrow; black bar on nape small; crissum orange-yellow ..... 36. *Pt. chrysorrhous*, p. 553.

d'. Lower parts of abdomen and crissum rich orange ..... 37. *Pt. xanthorrhous*, p. 553.

f. Head and neck rose-colour, graduating into carmine on the breast, beneath which is a broad white band, followed by another of blackish green ..... 38. *Pt. porphyreus*, p. 553.

g. Throat, crown, and sides of face in front scarlet, chin and throat black; middle of breast rose-colour; under tail-coverts chestnut ..... 39. *Pt. jambu*, p. 554.

h. Throat white or pale grey.

a'. Scapulars and tertials grey, margined with green.

a''. Top of head bright carmine; mantle, neck, and breast bluish grey; lower part of breast crossed by a white band, succeeded by a broad one of deep orange; shoulders deep orange 40. *Pt. wallacei*, p. 555.

b''. Forehead deep orange; crown and occiput yellowish green; back and upper part of breast plumbeous; underparts yellowish green..... 41. *Pt. aurantiifrons*, p. 556.

c''. Shoulders dark purplish red; lower parts of throat dark yellow; breast dark ochre; tail dark green, with a light-yellow apical band.

1. Top of head and sides of face purplish red ..... 42. *Pt. ornatus*, p. 556.

2. Top of head and sides of face olive-yellow ..... 43. *Pt. gestroi*, p. 557.

b'. Middle of scapulars and lesser wing-coverts rosy purple.
a''. Tail uniform dark green ..... 44. *Pt. perlatus*, p. 557.
b''. Tail dark green, with an apical greyish white band ..... 45. *Pt. zonurus*, p. 558.
i. Head, except occiput, light grey; abdomen reddish purple..... 46. *Pt. iogaster*, p. 558.
j. Forehead and chin greenish grey; reddish purple spot on breast ..... 47. *Pt. pectoralis*, p. 559.
k. Forehead and chin grey; tips of tertials and bar across the shoulders grey.
a'. Lower part of throat and upper part of breast dark reddish purple; tail bronzy green, tipped with yellow ..... 48. *Pt. viridis*, p. 560.
b'. Lower part of throat and upper part of breast bright reddish purple; tail yellowish green, each feather with a subterminal grey spot on the inner web... 49. *Pt. geelvinkianus*, p. 560.
l. Head white, secondaries slate-grey; centre of throat and chest crimson ..... 50. *Pt. eugeniæ*, p. 561.
m. Upper parts, throat, and upper part of breast green.
a'. Breast crossed by a broad white band; forehead purplish red.
a''. Rose spot on abdomen.
1. Crissum and under tail-coverts bright yellow ..... 51. *Pt. rivolii*, p. 561.
2. Crissum and under tail-coverts green, edged with yellow ..... 52. *Pt. prasinorrhous*, p. 562.
b''. No rose spot on abdomen ..... 53. *Pt. strophium*, p. 563.
b'. Breast crossed by a broad band, lemon-yellow above, white beneath.
a''. Front and crown rosy red; purplish red spot on abdomen ..... 54. *Pt. bellus*, p. 563.
b''. Front and crown green; abdomen lilac 55. *Pt. speciosus*, p. 564.
c'. Band on breast, crissum, and under tail-coverts yellow; top of head and middle of abdomen lilac .... 56. *Pt. johannis*, p. 564.
n. Feathers of neck and breast lanceolate, sulphur-yellow, tinged with green; abdomen, vent, and under tail-coverts bright yellow 57. *Pt. luteovirens*, p. 565.
c. Head and neck olive-green; plumage green; secondaries tipped with yellow; under tail-coverts yellow, blotched with green . 58. *Pt. corriei*, p. 566.
p. Head and neck greenish yellow; under tail-coverts bright yellow; rest of plumage green ..... 59. *Pt. layardi*, p. 567.
q. Head and throat olive-green; rest of plumage orange-carmine ..... 60. *Pt. victor*, p. 568.
r. Top of head light grey
a'. Sides of head and upper part of breast ashy white; a dark purple band across the breast; flanks and underparts ashy green; under tail-coverts cinnamon; chin black..... 61. *Pt. leclancheri*, p. 568.
b'. Sides of face and occiput purplish red; centre of breast ochraceous..... 62. *Pt. occipitalis*, p. 569.
c'. Sides of face, breast, and flanks grey; centre of abdomen yellowish white; thighs and under tail-coverts cinnamon; chin deep chestnut ..... 63. *Pt. gularis*, p. 570.

d'. Head, neck, and underparts partly grey, partly golden-ochre; under tail-coverts grey and white intermixed; sides of head bluish red; black band on back of neck ..... 64. *Pt. fischeri*, p. 571.

s. Head white.

a'. Abdomen yellowish green, separated from breast by a black band.

a''. Neck and breast light blue ..... 65. *Pt. albocinctus*, p. 571.

b''. Neck and breast white.

1. Tail black, with apical dark grey band 66. *Pt. cinctus*, p. 571.

2. Tail greyish black, with apical third yellowish white ..... 67. *Pt. lettiensis*, p. 572.

t. Head and neck greenish grey.

a'. Red spot on lower part of breast; abdomen and flanks yellowish ochre ..... 68. *Pt. bernsteini*, p. 572.

b'. Centre of throat and neck in front and underparts to the thighs purplish red 69. *Pt. puella*, p. 574.

c'. Larger race of the above ..... 70. *Pt. assimilis*, p. 574.

d'. Still larger; centre of throat and underparts deep purple ..... 71. *Pt. magnificus*, p. 575.

1. PTILOPUS GREYI.

Ptilopus greyi, Grey, List B. Brit. Mus. (1856) p. 4. sp. 8, desc. nulla—Columbæ; id. List B. Trop. Isl. (1859) p. 38; id. Proc. Zool. Soc. 1859, p. 165; J. Verr. & Des Murs. Rev. Zool. 1860, p. 435; Bon. Iconogr. Pig. (1857) pl. xx.

Ptilopus purpuratus, Bon. (nec auct.) Consp. Gen. Av. vol. ii. p. 19. sp. 1.

Hab. New Caledonia (*Germain*); Isle of Pines (*Gray*); Lifu, Loyalty Islands (*Whitmee*); Erromango, New Hebrides, Vanikoro (*Voy. Astrolabe*).

This handsome species was first named by Gray, but not described (*l. c.*). Bonaparte gave a description and very good figure of the bird in his Iconogr. Pig. pl. 20, from the specimen brought, by the naturalists attached to the expedition of the 'Astrolabe,' from Vanikoro Island. The species has a rather extensive distribution, from New Caledonia and neighbouring islands to Vanikoro on the north. Young and immature birds are greener on the breast and neck than the adults; and the first primary is not so abruptly attenuated.

Adult. Front and top of head deep rose, margined posteriorly with yellow; back of head, neck, and breast pale greyish green; throat yellowish white; flanks and sides of crissum bright green; abdomen very deep rose-colour, running into orange-yellow on crissum. Under tail-coverts rose-colour, but not so dark as on the abdomen. Upper parts bronzy green. Primaries black on inner web, dark green on the outer, and the innermost ones tipped with bronze-green; first primary abruptly attenuated, end very narrow. Secondaries shining green, edged with yellow. Tertials and some of the innermost secondaries with a pale lilac spot near their tips. Tail dark green, with a subterminal grey band. Bill black, with pale tip. Feet brown, possibly red in life. Total length 8 inches, wing 5, tail 3, culmen $1\frac{1}{2}$.

Specimen described is the one figured by Bonaparte, Iconogr. Pig. pl. 20, ex Vanikoro.

Another specimen from New Caledonia, marked as a female, differs from the male only in having the forehead slightly tinged with rose, and the abdomen mottled with rose and bright yellow. The under tail-coverts are deep rose on their apical half, as in the specimen from Vanikoro. The secondaries are more broadly margined with yellow, and the primaries tipped with white. I am inclined to regard this example rather as an immature male than a female. Three examples are in the British Museum from Erromango Island, one of the New Hebrides, which are in all respects like the one in the Paris Museum figured by Bonaparte from New Caledonia.

2. PTILOPUS NEGLECTUS.

Ptilopus neglectus, Schleg. Mus. Pays-Bas (1873), p. 7, *Columbæ*.

Hab. Océanie! Viti? (*Schlegel*).

Allied to the *Pt. greyi*, but differs in having the lower part of the abdomen and under tail-coverts tinged with sulphur, the abdomen and breast washed with olive-green, the purplish-red spot being placed upon the *breast* and *not on the abdomen*, and in the neck and upper part of breast being tinged with light grey (*Schlegel*). Wing 5 inches, tail 2 inches 3 lines.

The locality suggested by Schlegel, as given above, "Viti," is without doubt incorrect, as there are no indications to support the idea, the relatives of this bird having been procured in quite a different group of islands.

3. PTILOPUS BONAPARTEI.

Ptilopus purpuratus, Bon. (nec auct.) Iconogr. Pig. (1857) pl. xix. fig. *a*, adult, ex Balaou (nec Vanikoro).

Ptilopus bonapartei, Gray, Hand-l. B. vol. ii. (1870) p. 225, descr. nulla, founded on pl. 19, Bon. Iconog. Pig.

Hab. Balaou, Fiji Islands (*Hombron and Jacquinot*).

This is the species figured by Bonaparte as *Pt. purpuratus*, fig. *a* (*l. c.*). The specimen is in the Paris collection; and the plate gives no idea of the bird; which is reddish in all lights, but in certain ones exhibits a brilliant coppery-red hue. Bonaparte committed two strange errors in reference to this bird. He stated that it came from the island of Vanikoro, and also figured as the young the *Pt. purpuratus*, Wagl., from Tonga-Tabou, a very different and distinct species. Gray (*l. c.*) bestowed the name of *Pt. bonapartei* (*l. c.*), ex Vanikoro!, on the bird represented by Bonaparte on plate 19 of his work, 'Iconographie des Pigeons.' Gray could never have seen the specimen; or else he would have corrected Bonaparte's error, and stated that it did not come from Vanikoro, but from Balaou, and also that Bonaparte had confounded two species. Gray gives no description, which also strengthens the belief that he did not know the species autoptically. It is a question whether Gray's name should be noticed at all; for to name species without seeing them, on the chance of their proving new, is not a commendable practice; and, as he did not designate which figure he bestowed the name of *bona-*

partei upon, it is of course impossible to know whether it ought to be applied to the present or to the Tonga-Tabou bird. As, however, I now have selected the Balaou species as the type of *bonapartei*, in order to avoid giving it a new name (for it is quite distinct from the *Pt. purpuratus*, Wagl.), and as the type will be in the collection of the Paris Museum for future reference, it will not be difficult hereafter to ascertain what the species really is. The type is unique.

Adult. Front and crown rosy purple, faintly margined posteriorly with yellow; throat white; occiput, neck, and breast ash-colour, tinged with green; abdomen and flanks green; an indistinct dark green spot in the middle of the former. Back and wings green, with strong coppery-red reflexions. Inner secondaries with a small dark green spot at tips, and all edged with yellow. Primaries dark coppery red, edged with white. Tail above green, with bright coppery-red reflexions, and with a subapical greyish-white band; beneath dark grey, with a broad apical white band. Crissum and under tail-coverts bright yellow. Bill greyish black, with yellow tip. Feet light red. Total length 9 inches, wing $5\frac{1}{2}$, tail $3\frac{1}{4}$, culmen $\frac{5}{8}$.

4. PTILOPUS PURPURATUS.

Columba purpurata, Shaw, Gen. Zool. vol. xi. p. 66 (1819), partim; Wagl. Syst. Av. (1827) *Columbæ*, sp. 30.

Columba porphyracea, Temm. Trans. Linn. Soc. vol. xiii. p. 130? (1822).

Columba porphyrea, Wagl. Syst. Av. (1827) sp. 31?, *Columbæ*.

Columba forsteri, Desm. Dict. Scien. Nat. vol. xl. p. 340 (1826)?; Less. Compl. Buff. tom. iii. Ois. p. 34 (1837), ex Tonga-Tabou.

Columba purpurata, Wagl. (nec Gmel.) Isis, 1829, p. 742, ex Tonga-Tabou (1829).

Columba porphyracea, Licht., Forst. Descr. Anim. p. 167 (1844); Finsch & Hartl. Fauna Centralpolyn. (1867) p. 119; Gräffe, Journ. Mus. Godeffr. tab. 7. fig. 3.

Ptilonopus porphyracus, Gray, Gen. B. (1844–49) vol. ii. p. 466; id. B. Trop. Isl. p. 38 (1839); id. List Columb. p. 3 (1856), partim.

Ptilopus purpuratus, Bon. (nec Gmel.) Iconogr. Pig. (1857) pl. xix. fig. *b*, juv., spec. Paris Mus. ex Tonga-Tabou (Voy. Astrolabe), nec Vanikoro.

Ptilinopus porphyraceus, Finsch & Hartl. Journ. für Ornith. 1870, p. 131; Finsch, Proc. Zool. Soc. 1877, pp. 725, 775, 783.

Ptilonopus porphyraceus, Reich. Taub. p. 95; Layard, Proc. Zool. Soc. 1876, p. 502.

Ptilonopus purpuratus, Reich. (nec auct.) Taub. p. 94?

Columba kurukuru, variété, Temm. & Knip, Pig. vol. i. pl. 35?

Ptilopus fasciatus, Layard (nec Peale), Ibis, 1876, p. 392.

Hab. Tonga-Tabou, Waikai, Mango, Mokani, Loma-Loma, Taviuni, Fiji Islands, Futuna, Friendly Islands (*Layard*); Niuafou Island, most northern of Tonga group (*Finsch*); Hapai (*Gräffe*); Eua, Friendly Islands (*Hübner*); Savage Island (*Whitmee*); Vavao, Friendly Islands.

It is apparently a difficult matter for authors to decide upon the

correct name for this Fruit-Pigeon; and, as will be seen by the list of synonyms given above, the species has been presented with a very fair number of appellations. In order to explain why I consider that this bird, of all those given in this paper, should alone bear the name of *purpuratus*, it will be necessary to begin at the beginning. Latham, in his 'General Synopsis of Birds,' vol. ii. p. 626. sp. 15 (1783), describes a Dove, which he says came from Otaheite, as the "Purple-crowned Pigeon," the chief characteristics of which were:—"*Forehead to the middle of the crown purple*; head, neck, and *underparts of body* pale green, inclining to ash-colour; vent and under tail-coverts yellow. Tail greenish black, with green edges, and when spread a greyish bar appears near the end, the colour only occupying the inner webs of each feather." To this description Gmelin gave the name of *Columba purpurata*. Now there is no Pigeon known belonging to the genus *Ptilopus* that will answer to the above description of Latham. *No such bird is found upon the island of Otaheite*, whence, according to Latham, this curiously compounded specimen came; for it carries the *head* of the bird from Tonga-Tabou and the *body* of the species found in Otaheite, distinguished afterwards by Lesson as *taitensis*. Latham possessed specimens from both these localities, and remarked upon their differences, but did not deem them distinct species; and it is very evident that when he wrote his description he took his characters from both forms. The bird from Otaheite does not possess a purple forehead or crown, these parts being ash-colour with but a faint tinge of lilac; therefore it could never have been designated as the "*Purple-crowned* Pigeon." Nor does the Tonga-Tabou bird have the *underparts of the body* pale green inclining to ash-colour (which is a characteristic of the Otaheite species), but has the flanks and abdomen grass-green, with a conspicuous purplish-black spot in the centre of the latter. Therefore the name *Col. purpurata*, Gmel., having been founded upon a bird that did not exist, taken from a description comprising portions of two distinct species, cannot be accepted, and should be rejected from the nomenclature of the genus.

The next author after Gmelin who mentioned this species was Shaw (*l. c.*) (1819). He, however, also confounded two species, and his name of *purpurata* must be passed over. Temminck follows in 1822 (*l. c.*) with *Columba porphyracea*; and this name, attributed to Forster, has been used by various writers when referring to this bird, especially from the island of Tonga-Tabou. Now the *C. porphyracea* of Temminck was bestowed upon the bird figured by Madame Knip in their great work on the Pigeons, at plate 35, and there considered as a variety of the *Pt. ewingii*, and called *Columba purpurata*. Temminck states (Trans. Linn. Soc. 1822, p. 130) that his specimen came from *New Holland*! The figure resembles no species from that country, nor indeed from any other; and it can only be through an examination of the type that a correct knowledge of the species intended can be ascertained. I have therefore placed Temminck's name, as well as *porphyrea*, Wagl., founded upon Temminck's bird, whatever it may have been, among the synonyms of

the present species with a doubt[1]. Desmarest also published a name (*l. c.*) for the bird depicted on Temminck's plate, viz. *forsteri*. This, for the same reason which has placed Temminck's name on one side, will also have to go among the list of doubtful synonyms. We now come to Wagler, 'Isis,' 1829, who first diagnosed as distinct both species, from Otaheite and Tonga-Tabou respectively, and gave names to each, and properly portrayed their distinctive characters. To the Tonga bird with the purple crown he applied the term *purpurata*, which name will take precedence; and the Otaheite species he called *oopa*. Unfortunately he did not appear to be cognizant of the name *taitensis* previously given to this species by Lesson, Voy. Coq. tom. i. text, p. 297 (1826); and therefore *oopa* will of course become a synonym of Lesson's term.

Mr. Layard speaks of this species under the name of *porphyraceus*, Forst., as not uncommon in the Friendly Islands. In its habits it resembles the other species of this genus, and is called by the natives "Kullu kullu." The female, when in full breeding-dress, resembles the male, but is not so brightly coloured on the abdomen, the male at this season having the black abdominal patch shading away into brilliant purple.

Adult. Front and top of head, extending in a curved line behind the eyes, rich purple, edged with light yellow. Rest of head, neck, upper part of back, throat, and breast pale ashy green. Flanks and abdomen grass-green, with a dark purple spot in the centre of abdomen. Crissum and under tail-coverts bright yellow, tinged with orange on the tips of the coverts. Back and upper tail-coverts dark yellowish green. Wings the same colour, with the inner secondaries and some of the scapulars deep bluish green near their tips. Primaries black on their inner webs, green on their outer, and, together with the secondaries, margined with yellow; first primary abruptly attenuated and very narrow at the end. Rectrices bright green on their outer webs, brownish black on their inner, with a terminal grey or ash-coloured band, this margined with yellow. Under surface smoke-colour, terminal portion white. Bill black, tip flesh-colour. Feet brownish. Total length $8\frac{3}{4}$ inches; wing $5\frac{1}{4}$; tail $3\frac{3}{4}$; bill, culmen $\frac{5}{8}$.

Young. Resembles the adult, except that the top of the head is ashy like the breast, with only a tinge of purple on the forehead. The back of the neck is pale green, instead of ash-colour; and the plumage of the upper part, tail, and wings is bronzy.

5. PTILOPUS APICALIS.

Lamprotreron apicalis, Bon. Compt. Rend. vol. xxxix. p. 877 (1854).

Ptilinopus apicalis, Bon. Consp. Gen. Av. vol. ii. (1857) p. 23; Finsch & Hartl. Centralpolyn. (1867) p. 121.

Ptilonopus apicalis, Reich. Tauben, p. 97.

Hab. Samoa, Vavao (*Bonaparte*).

This species, described by Bonaparte (*l. c.*), while resembling in

[1] See further remarks upon this plate 35 in the article on *Pt. coralensis*.

general appearance the preceding one, differs from all others in the colour of the spot upon the abdomen. In the type this is mixed with rufous and yellow, the latter colour perhaps predominating; but in a second specimen, also in the Paris collection, the spot is more rufous, and extends over a greater space. I regard this latter as a more adult individual. It unfortunately bears no precise locality, but has merely marked upon the stand, "donné par la Société des Missions Catholique de l'Océanie en 1849." The type was brought by Hombron and Jacquinot from the Samoan Islands in their Voyage au Pôle Sud. The exact island is not given on the specimens by these travellers; but Bonaparte has stated Vavao to be the habitat. I am not aware how he ascertained this island to be the one in which the specimen described by him was procured.

Adult. Front and crown rosy purple, faintly margined with yellow; throat yellowish white; occiput and back of neck pale green; sides of neck and breast greenish grey; flanks and abdomen pale green, with a rufous spot tinged with yellow in the centre of the latter; crissum and under tail-coverts bright yellow, inclining to a deep orange hue at the tips. Upper part and wings bronzy green. Secondaries margined on outer webs with pale yellow. Tail bronzy green, with an apical light-yellow band. Bill green? Feet dark red? Total length 7$\frac{1}{2}$ inches; wing 5$\frac{1}{4}$, tail 3$\frac{1}{2}$, culmen $\frac{5}{8}$. (Type.)

6. PTILOPUS CORALENSIS.

Ptilopus coralensis, Peale, U.S. Expl. Exped. (1848) p. 190, pl. 51; Cass. U.S. Expl. Exped. 2nd ed. (1858) p. 272, pl. 32; Schleg. Mus. Pays-Bas, 1873, p. 14, *Columbæ*.

Columba purpurata, Temm. & Knip, Pig. vol. i. pl. 35?

Ptilopus viridissima, Bon. Consp. Gen. Av. vol. ii. p. 20 (1857).

Kurutreron coralensis, Bon. Consp. Av. vol. ii. p. 26. sp. 3 (1857); Reich. Taub. p. 93; id. Novit. Suppl. p. 203, t. iii. f. 33.

Ptilinopus coralensis, Cass. Wilkes Expl. Exped. text, p. 272, atl. pl. 32 (1858).

Ptilonopus coralensis, Gray, List B. Trop. Isl. p. 37 (1859).

Ptilonopus viridissimus, Gray, List B. Trop. Isl. p. 38 (1859), partim; Reich. Tauben, p. 95, pl. 236 *b*. fig. 3367.

Ptilinopus viridissimus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 134.

Hab. Island of Carlshoff, Paumotu group (*Peale*).

The type of Bonaparte's *Ptilopus viridissimus* is in the Paris Museum. The example, which was brought home by M. Maugé, the surgeon attached to the expedition commanded by Captain Baudin, is marked as from Timor. This locality is evidently erroneous, as no species belonging to this particular group of the genus *Ptilopus* is found in that island, but all are, on the contrary, apparently confined to the islands of the South Sea, from some one of which it is most probable the specimen described by Bonaparte was brought. It is in a bad condition, the primaries and tail being worn away to a considerable degree, as though the bird had been in captivity at

some period of its existence. It may possibly have been purchased by Maugé at Timor. In the coppery-red hue of the wings, as well as the tail, it answers well to the description given by Peale (*l. c.*) of his *P. coralensis*; and I have therefore assigned it to that species. The back of the type is not "viridissimum immaculatum," as described by Bonaparte, but has very conspicuous violet spots on the scapulars.

I have given among the synonyms of this species the *Columba purpurata*, var., figured by Madame Knip on plate 35 of the work on Pigeons. Temminck states that there are two specimens in the Paris Museum, brought by Capt. Baudin, which resemble the type of his plate 35. I find that the type of Bonaparte's *Pt. viridissimus* is marked as follows:—"*Ptilopus viridissimus*, Bp. ex Temm. tab. 35, nec 34." This unquestionably refers to the work of Temminck and Knip; but whether it is also intended to indicate that the example was the original of Madame Knip's plate I am unable to ascertain. I deem it very probable, however, that it is the original from which the drawing was made. In that case this bird would bear the name of *porphyraceus*, Temm. Trans. Linn. Soc. 1822, p. 130, which antedates *coralensis*, Peale.

Mr. Peale states that this Dove attracted his attention by its plaintive call, resembling *hoot-hoot-hoot*, uttered in rapid succession. Although not wild, it was very difficult to see them, as their plumage accorded so well with the leaves. Specimens were subsequently obtained on the low coral islets of the Paumotu group, but nowhere else. They always kept in the most wooded and secluded places.

Male. "Vertex having a very pale rubiaceous spot, which does not reach to the base of the bill; bill yellow; irides red; head, neck, and breast ashy, the feathers having a very pale greenish-yellow band near their tips, those on the breast bifurcate; back and rump green, inclining to olive; vent, wings, and tail, when viewed in a positive light, bright copper-colour, barred with golden green; underparts of the wing and tail cinereous; quill-shafts brown; tail-shafts white beneath and black on the upper surface; tail even, the inner web having a dark bar near the tip; tertiary feathers edged with yellow; primaries and secondaries having a very narrow margin of white; feathers on the leg cinereous. Total length 9 inches; tail $3\frac{1}{10}$, extent of wings 17, bill $\frac{1}{2}$, tarsus 1."—*Peale* (*l. c.*).

7. PTILOPUS CHALCURUS.

Ptilonopus chalcurus, Gray, List Birds Trop. Isl. Brit. Mus. (1859) p. 37.

Ptilinopus chalcurus, Finsch & Hartl. Faun. Centralpolyn. (1867), p. 131.

Hab. Harvey Islands, Cook's Archipelago (*Gray*).

The type of this species (?) is in the British Museum, where I have had an opportunity of examining it. The colour of the forehead is amethyst, a lighter hue than in *Pt. viridissimus*, Bon.; but in their coppery tints the two birds greatly resemble each other. Gray separated this Harvey-Island bird from *Pt. coralensis*, Peale, on account of the light-coloured front and crown. Without the

type of Peale's species to compare it with, I cannot say if the difference mentioned is sufficient to separate the present form as distinct, and for the present leave it under the designation given to it by its describer.

Forehead amethyst. Crown, occiput and nape pale green. Throat yellowish; sides of neck and breast greyish ash; abdomen pale green. Back and wings bronzy-green. Primaries and secondaries with a coppery-red hue in certain lights. Tail coppery red, with a greenish shade; but in the majority of lights the feathers are bright copper-colour. Crissum and under tail-coverts pale yellow. Bill, legs, and feet yellowish in the skin. Wing 5½, tail 4in. (Type.)

8. PTILOPUS PICTIVENTRIS. (Plate XXXIII.)

Ptilonopus fasciatus, Whitmee (nec Peale), Proc. Zool. Soc. 1873, p. 152 (spec. exam.)

Ptilonopus apicalis, Lay. (nec Bon.), Proc. Zool. Soc. 1876, p. 495.

Ptilopus pictiventris, Elliot, Ann. & Mag. Nat. Hist. ser. 5, vol. i. p. 349 (1878).

Hab. Nukahiva, Marquesas Islands (?) (type Paris Museum); Samoa (*Whitmee*); Savage Islands (*Brenchley*); Navigators' and Friendly Islands (*Layard*).

This species was sent from Samoa by the Rev. S. J. Whitmee, and marked by him *Pt. fasciatus*. I have examined his specimens now in the British Museum, from one of which the figure (Plate XXIII.) is taken; and they agree exactly with my type in the Paris Museum. Mr. Whitmee states (*l. c.*) that this bird is kept generally in captivity by the natives of the Samoan Islands, and they train it to act as a decoy for the wild bird. I described this species from a specimen in the Paris Museum, stated to have been brought by Hombron and Jacquinot from Nukahiva of the Marquesas. I am inclined to think this locality may be erroneous, as I find on the bottom of the stand that it is first stated to have come from "Upolu," Samoan group. This was erased and Nukahiva substituted. It seems to me, in view of the Rev. Mr. Whitmee's examples, that Upolu is probably the correct locality of the type. Mr. Layard, in the 'Proceedings' of this Society, 1876, p. 495, has erroneously referred this bird to the *Pt. apicalis*, Bon. This latter species, the type of which is before me, has a rufous spot mixed with yellow in the centre of the abdomen, without any black line about it. The secondaries are also uniform bronzy green without any lilac spots near their tips; and the under tail-coverts are bright yellow inclining to an orange hue at their tips. The present species and *Pt. apicalis* are readily distinguishable from each other, the purplish-black line above the rufous on the abdomen of the present bird being at all times sufficient to separate it. Mr. Layard states that he found this species abundant, feeding on wild berries, and having a pleasing rolling "coo." The females were not so brightly coloured as the males; and the young have the whole of the underparts scaly with yellow edges to their green feathers. They exhibit no trace of the bifurcation in the breast-feathers, as in the adults; nor is the

first primary so greatly attenuated. Front and crown rosy purple, with a very faintly indicated yellow margin, almost obsolete. Occiput greenish grey. Throat whitish; neck, upper part of mantle, and breast ashy green. Flanks light green. Centre of abdomen rufous, bounded above by a deep-purple line. Crissum and under tail-coverts bright yellow, the latter orange towards their tips. Back and upper tail-coverts bright green. Scapulars tipped with lilac. Tail bright green, with a broad apical yellow band. Bill greenish with a yellow tip. Feet brown in the skin. Total length 8½ inches, wing 5¼, tail 3, culmen $\frac{9}{16}$.

9. PTILOPUS PELEWENSIS.

Ptilinopus pelewensis, Hartl. & Finsch, Proc. Zool. Soc. 1868, p. 7, 1872, p. 101; Gräffe, Journ. Mus. Godeffr. 1873, pt. 1, pl. 7. fig. 5; Finsch, Vög. Palau-Gruppe, Journ. Mus. Godeff. 1875, Heft viii. p. 24.

Hab. Pelew Islands.

This species, described by Messrs. Hartlaub and Finsch (*l. c.*) belongs to the second group into which I have divided the green Fruit-Pigeons of the South-Sea Islands, viz. the one with the yellow apical band on the tail. It differs apparently from its relative in the violet spot on the breast-feathers, and in the colouring of the under tail-coverts, and also, as Dr. Finsch writes me, in the large orange vent-spot. It is evidently a very distinct species. In their first description the above-mentioned authors state that the under tail-coverts are white at base, then yellow, with the tips rose-violet. In the Society's 'Proceedings' for 1872, p. 101, they describe these coverts as bright purplish red, with narrow bright orange edgings. From this there would seem to be considerable variation in the hues of these feathers. I have not seen an example of this species.

Adult. Front and crown rose-violet, margined with yellow; rest of head and neck pale greenish yellow, feathers of upper part of breast crossed transversely with violet spots, tips greenish yellow. Middle of abdomen deep orange. Crissum yellow. Under tail-coverts white at base, then yellow, with the tips rose-violet. Upper parts light green. Primaries black, tipped and margined on the outer web with light green. Secondaries bright green edged with yellow. Middle rectrices green; lateral ones black on inner webs, green on outer, all with an apical yellow band. Bill lead-colour, feet flesh-colour. Length 9½″, wing 8″ 2‴, tail 2½″, tarsus 10‴, bill 6‴ (*Hartl.* and *Finsch*).

10. PTILOPUS REGINA.

Columba purpurata, prem. var., Temm. Pig. et Gall. tom. i. p. 282 (1813) (?).

Columba purpurata, var. *regina*, Swains. Zool. Journ. vol. i. (1825) p. 473.

Columba purpurata, Jard. and Selby, Illust. Ornith. vol. ii. pl. 70 (nec auct.).

Ptilinopus swainsoni, Gould, Proc. Zool. Soc. 1842, p. 18; id.

Birds Austr. vol. v. pl. 55; id. Hand-b. B. Austr. vol. ii. p. 106; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 125; Gräffe, Journ. Mus. Godeff. 1873, pt. 1, pl. 7. fig. 6; Ramsay, Proc. Zool. Soc. 1876, p. 114.

Ptilonopus swainsoni, Gray, Gen. B. (1844) vol. ii. p. 466. sp. 6; id. List B. Brit. Mus. (1856) p. 2. sp. 1; Reich. Tauben, p. 94, pl. 235. figs. 1309–10.

Kurukuru swainsonii, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 256.

Ptilopus swainsonii, Schleg. Mus. Pays-Bas, 1873, p. 4, *Columbæ*.

Hab. Australia, river Clarence, between the Hunter and Moreton Bay (*Gould*).

Temminck, in his 'Pigeons et Gallinacées,' (*l. c.*), describes a "première variété" of his *Columba purpurata* (=*ewingii*, Gould). This has been referred, by Messrs. Finsch and Hartlaub in their work on Central-Polynesian birds, to *Pt. fasciatus*, Peale. I do not think this is correct; and although it may be impossible to prove what really this "variety" of Temminck's is, yet it seems to me that his description points more towards the present species. In the first place Temminck makes no mention of a purplish-black spot upon the abdomen, which *Pt. fasciatus* (Peale) possesses; and he describes the belly as exhibiting "plusieurs nuances de jaune et d'orange," which certainly are not to be found on Peale's bird, which has this part grass-green with a purplish black spot in the centre. As the *Columba purpurata*, Temm., is known to be the *Pt. ewingii*, Gould, and did not come from Tahiti, it is probable that he had with it the *Pt. regina*, also from Australia, and looked upon them as varieties of the same species. As this cannot, however, be definitely ascertained, I have placed his name among the synonyms, with a question. Temminck states that there are two specimens in the Paris Museum, brought by Capt. Baudin, which are like the variety described by him. I have examined all the examples brought by Baudin's expedition; and they belong only to the *Pt. ewingii* and *Pt. viridissimus*, Bon. (=*coralensis*, Peale). This species has been generally known as the *Ptilopus swainsoni*, Gould; but it was called *regina* by Swainson seventeen years before Mr. Gould's name was published. In fact it is the type of Swainson's genus *Ptilonopus* (*Ptilopus*); and Gould's name must become a synonym.

Male. Forehead and top of head crimson, margined narrowly with yellow. Occiput and back of neck greyish green. Throat white, sometimes tinged with yellow. Breast pale green, each feather tipped with light grey. Flanks dull green. Abdomen deep orange, with a spot of deep lilac-red in the centre. Crissum and under tail-coverts orange-yellow. Upper parts bright green. Primaries slaty grey on inner webs, green on the outer, edged with yellow. The first abruptly and greatly attenuated. Secondaries bluish green, becoming deep blue near their tips, and broadly margined with yellow. Tail deep green, with a broad terminal rich yellow band. Irides reddish orange. Bill greenish black, horn-colour at the tip. feet olive-brown. Total length 9¼ inches, wing 5½, tail 3½, culmen ½.

Immature. Front tinged with rose-colour; loral space and a line over the anterior half of the eye light yellow. Head, neck, cheeks, back, and breast green, the feathers of the latter tipped with light yellow. Throat yellowish white. Abdomen and under tail-coverts light yellow; the lilac-red spot absent. Rest of plumage as in the adult.

Specimens described are those figured by Bonaparte, Iconogr. Pig. pl. 21.

11. PTILOPUS EWINGII.

Columba purpurata, Temm. Pig. et Gall. tom. i. p. 280 (1813); Less. Traité Ornith. (1831), p. 472 (nec auct.).

Columba purpurata, Desmar. Dict. Sc. Nat. vol. xl. (1826) p. 339; Knip & Prév. Pig. vol. i. pl. 34 (nec auct.).

Le Kurukuru, Less. Compl. Buff. Ois. tom. iii. p. 32 (1837).

Ptilinopus purpuratus, Selby, Nat. Libr. vol. v. pt. 3, p. 103 (1835) (not from Otaheite); Swains. Class. Birds, vol. ii. p. 347 (nec auct.).

Ptilinopus ewingii, Gould, Proc. Zool. Soc. 1842, p. 19; id. B. Austr. vol. v. pl. 56.

Ptilonopus purpuratus, Gray, List B. Brit. Mus. (1844) p. 2, *Gallinæ*.

Ptilonopus ewingii, Gray, List B. Brit. Mus. (1844) p. 2, (1856) p. 3. sp. 2; id. Gen. B. vol. ii. (1844) p. 466; Reich. Tauben, p. 94, pl. 235. figs. 1307–8.

Kurukuru roseicapillus, Des Murs & Prév. (nec Less.), Voy. Vénus, Ois. p. 262 (1855), partim.

Ptilinopus flavicollis, Gray, List B. Brit. Mus. (1856) p. 3. sp. 3.

Ptilonopus flavipectus, Reich. Tauben, p. 94, pl. 235. fig. 1305 (ex pl. 35, Knip, Pig.), ex Timor.

Ptilonopus flavicollis, Reich. Taub. p. 95; Gray, List B. Brit. Mus. (1856) p. 3. sp. 3; Wall. Ibis, 1865, p. 380.

Ptilopus flavicollis, Bon. Consp. Gen. Av. vol. ii. p. 20. sp. 4; id. Compt. Rend. (1855) tom. xl. p. 216. sp. 40; id. Iconog. Pig. (1857) pl. 25.

Ptilopus ewingii, Bon. Consp. Av. vol. ii. p. 20 (1857); id. Iconog. Pig. (1857), pl. 24. fig. 1; Schleg. Mus. Pays-B. 1873, p. 5.

Ptilinopus flavicollis, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 125.

Hab. Coburg peninsula, northern coast of Australia (*Gould*); Timor, Flores (*Semmelink*).

The representation of this species given by Madame Knip on plate 34 of her work is so badly executed that it is impossible to recognize what is intended; for it certainly resembles no species that was ever seen. Therefore Bonaparte was perfectly justified in giving another figure in his Iconogr. Pig. pl. 25, from which a very good idea of this species is obtained. It is very safe to say that, unless the originals of some of Madame Knip's plates had been preserved in the Paris Museum to show what the species really were, they would always have remained a stumbling-block to ornitho-

logists. I do not find, after a careful comparison of specimens from the two localities, that the birds from Timor and Australia show any characters that should separate them as distinct species. Desmarest, in the 'Dictionnaire des Sciences,' gives a species of *Ptilopus* as *Columba purpurata*. This has been referred to the *Pt. fasciatus* of Peale. As, however, the description mentions yellow and orange colours on the belly, and, moreover, this bird is referred to plate 34 of Temminck and Knip's 'Pigeons,' which represents *Pt. ewingii*, I have placed Desmarest's name among the synonyms given above.

Adult male. Forehead and crown rose-colour, margined with yellow. Sides of head greyish. Throat light yellow. Breast pale green, feathers tipped with yellow. Abdomen orange, with a pale lilac band crossing the upper part. Flanks green. Crissum and under tail-coverts orange-yellow. Back of neck and upper parts bright green. Wings bluish green. Primaries brownish black on inner webs, dark green on outer, margined with yellow, the first abruptly and greatly attenuated. Secondaries bluish green; base of inner webs brownish black, margined with light yellow. Tail bright green, with a broad terminal yellowish-white bar. Bill black, with yellow tip. Feet brownish. Total length 9 in., wing 5, tail $3\frac{1}{2}$, culmen $\frac{1}{2}$. (Specimen figured by Bonaparte.)

12. PTILOPUS RAROTONGENSIS.

Ptilinopus rarotongensis, Hartl. & Finsch, Proc. Zool. Soc. 1871, p. 30; Gräffe, Journ. Mus. Godeff. 1873, pl. 7. fig. 1.

Hab. Cook's Islands (*Finsch & Hartlaub*); Savage Island (*Whitmee, Brenchley*).

A specimen in the British Museum from Savage Island, one of the Friendly group, is apparently of this species, and answers quite well to the description given by Finsch and Hartlaub. The spot on the lower portion of the breast is rosy red in the centre, surrounded by very dark purple. Abdomen and under tail-coverts are yellow, the latter strongly tinged with orange towards the ends.

"*Adult.* Front and vertex purplish violet-red, surrounded by a narrow indistinct line of yellow; occiput, sides of head, neck, crop, and upper part of breast delicate grey, the feathers of the latter bifurcate and with a pale yellow cross band; chin and middle of throat white, washed with pale yellow; breast and remainder of underparts yellow, purer on the back and under tail-coverts, paler on the anal region; the sides washed with pale greyish green, the same as the feathered tarsus; on the middle of the lower portion of the breast a large spot of dark purplish red; back and upper parts vivid grass-green; primaries and their coverts on the outer web and end brilliant dark green, with a very narrow but distinct white margin, the inner web black; secondaries also dark green, but with a somewhat broader yellow margin along the outer web; coverts of the secondaries dark green, narrowly margined externally and at the end with yellow; larger shoulder-coverts brilliant dark green, broadly margined at the end with grass-green; wing beneath ashy grey; under wing-coverts

delicate grey like the neck; tail dark green with a broad greyish-white end; the feathers, except the two middle ones, are on the inner web dark grey, crossed above the white end by a blackish cross band; the white end is margined narrowly with pale yellow; tail beneath dark grey, at the end broadly white; bill plumbeous, tipped with pale horn-colour; feet reddish brown, nails dark; irides yellow; bill brownish yellow; legs purple-red.

"*Young*. Vertex and hind neck green like the back; front and forehead covered with a pale violet-purple patch; sides of head and neck grey, washed with green, the crop and upper portion of breast with greenish yellow; the underparts are of a less brilliant yellow; the sides darker greyish green; the red pectoral patch is indicated only by some dirty purplish feathers; the pale yellow margins at the ends of the coverts of the secondaries are broader and form a distinct cross line; the white end portion of the tail-feathers is washed at the outer web and apex with green; bill and feet brown; total length 8 inches, wing 5, tail 3·1."—*Finsch* and *Hartl.* (*l. c.*).

13. PTILOPUS FASCIATUS.

Ptilinopus fasciatus, Peale, U.S. Expl. Exped. Ornith. (1848) p. 193, pl.; Gray, List B. Brit. Mus. (1856) p. 4; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 115; Gräffe, Journ. Mus. Godeff. Heft i. (1872) p. 45, Taf. 7. fig. 2.

Ptilinope de Clémentine, Hombr. & Jacq. Voy. Pôle Sud (1841), pl. xxix. fig. 3.

Ptilinopus clementinæ, Bon. Compt. Rend. tom. xl. (1855) p. 216. sp. 48; id. Consp. Gen. Av. vol. ii. p. 22. sp. 9; id. Iconogr. Pig. pl. xxii. fig. 1 (1857); Reich. Taub. p. 96, tab. 240. fig. 2588; id. Suppl. p. 203, pl. iv. figs. 34, 35; Gray, B. Trop. Isl. p. 38; Finsch, Journ. Mus. Godeff. Heft xii. p. 37 (1876).

Columba viridissima, Temm. Pl. Col., text of *C. diademata*.

Ptinilopus! *clementinæ*, Jacq. & Puch. Voy. Pôle Sud, vol. iii. text (1853), p. 117, Atl. pl. xxix. fig. 3.

Kurukuru clementinæ, Des Murs & Prév. Voy. Vénus, Ois. p. 269 (1855).

Lamprotreron porphyracea, Bon. Consp. Gen. Av. vol. ii. p. 21.

Ptilopus clementinæ, Bon. Iconog. Pig. (1857) pl. xxii. fig. 1.

Ptilonopus fasciatus, Gray, List B. Trop. Isl. (1859) p. 37 (partim).

Ptilonopus clementinæ, Gray, List B. Trop. Isl. (1859) p. 38.

Ptilopus porphyraceus, Schleg. Mus. Pays-B. 1873, p. 8, *Columbæ*.

Ptilopus fasciatus, Schleg. Mus. Pays-B. 1873, p. 6, *Columbæ*.

Ptilonopus ponapensis, Finsch, Proc. Zool. Soc. 1877, p. 779.

Native name *Manu-tagi* (*Whitmee*).

Hab. Samoa (*Peale, Hombron* and *Jacquinot*); Ponapé Island (*Kubary*).

This is the species first described by Peale (*l. c.*) from Samoa, and afterwards by Hombron and Jacquinot as *clementinæ*. It is a well-marked bird, differing from all its allies in the yellowish hue of its throat, cheeks, and breast. The abdomen is pure green, with

a purplish-black spot in the centre. Several examples are before me, including the type of *Pt. clementinæ*; and the species is readily recognizable from all the others of this especial section of the genus *Ptilopus*. *Pt. apicalis*, Bon., sometimes referred to this species, is quite distinct. I place with a doubt, among the synonyms given above, the *Ptilinopus fasciatus* figured in the Journal of the Museum Godeffroy (*l. c.*); for the colouring of the figure is so defective that it is impossible to arrive at any satisfactory conclusion as to what species is meant. The purplish-black mark on the abdomen is apparently omitted. If the specimen does not possess this, it cannot be the *Pt. fasciatus*, and is probably *Pt. apicalis*, Bon. An examination of the bird itself could alone decide the matter.

Dr. Finsch, in a late number of these 'Proceedings' (1877, p. 779), described a *Ptilopus* from the island of Ponapé from specimens sent to the Museum Godeffroy by Mr. Kubary, as distinct under the name of *Pt. ponapensis*. Not being able to make out by the description wherein this bird differed from the *Pt. fasciatus*, Peale, I wrote to Dr. Finsch asking if it was not possible to have the type sent to me. On his making the request to the Directors of the Museum Godeffroy, they most kindly forwarded me three specimens, among which was the type of the description published in this Journal. I compared it with the examples in the Paris Museum; and, as I supposed it would be, the species is the same as *Pt. fasciatus*, Peale, being identical with those birds in the Paris Museum called *clementinæ* by Hombron and Jacquinot, and procured by them in the Voyage au Pôle Sud, and which do not differ specifically from the *Pt. fasciatus*, Peale. The *Pt. ponapensis* will therefore have to become a synonym of the present species.

Adult. Top of head and forehead bright purple, margined with pale yellow. Back and sides of neck, cheeks, upper part of back, throat, and breast pale yellowish green inclining to ash colour. Flanks and abdomen grass-green, with a purplish-black spot in the centre of the abdomen. Back and upper tail-coverts bronzy green. Primaries and secondaries black on inner webs; outer bright green, edged with yellow on the secondaries; first primary abruptly and greatly attenuated. Some of the innermost secondaries and tertials have a pale violet mark near their tips. Tail bright green, with the terminal fourth bright yellow. Crissum and under tail-coverts orange-yellow. Bill black, tip yellowish. Feet brown. Total length $8\frac{3}{4}$ inches, wing $5\frac{1}{2}$, tail $3\frac{3}{8}$, culmen $\frac{5}{8}$. (From Hombr. & Jacq. specimen in Paris Museum.)

14. PTILOPUS MERCIERI.

Kurukuru mercieri, Des Murs & Prév. Voy. Vénus, Ornith. p. 266 (1855).

Ptilopus mercieri, Bon. Compt. Rend. tom. xl. (1855) p. 216; id. Iconog. Pig. pl. xxii. fig. 2 (1857); id. Consp. Gen. Av. vol. ii. (1857) p. 22. sp. 8.

Ptilinopus mercieri, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 128; Finsch, Proc. Zool. Soc. 1877, p. 410.

Ptilonopus mercieri, Gray, List B. Trop. Isl. (1859) p. 36; Reich. Tauben, p. 96.

Hab. Nuka-hiva, Marquesas Islands. (Type.)

A very rare and well-marked species; but one or two examples besides the type in the Paris Museum are, I believe, all that are known in European collections. It resembles in its coloration the last species, but is readily recognized by the red spot on the head at the base of the mandible.

Adult. Entire upper part of head and occiput and a conspicuous spot at base of the mandible deep rosy purple. Nape, mantle, sides of neck, throat, and breast pale yellowish green, with a tinge of ash upon cheeks and nape. Abdomen and flanks bright greenish yellow; crissum and under tail-coverts bright yellow. Back and upper tail-coverts bright green, with a yellowish tinge upon the latter. Wings same colour as the back; primaries black, shaded with very dark green upon the outer webs, the first abruptly and greatly attenuated; secondaries black on the inner webs, dark green on the outer, and margined with yellow; the innermost ones with a conspicuous blue-black spot near the tips, and margined broadly with yellow. Rectrices smoke-colour at base, the outer webs barred with pale green in the centre, this colour sometimes extending slightly onto the inner web; and all the apical third very light yellow. Bill black with light tip. Feet brown. Total length 9 inches, wing $5\frac{1}{2}$, tail $3\frac{3}{8}$, culmen $\frac{1}{2}$. (Description taken from type in Paris Museum.)

15. PTILOPUS ROSEICAPILLUS.

Columba roseicapilla, Less. Trait. Ornith. p. 472. sp. 44 (nec syn.) (1831).

Le Kurukuru des Mariannes, Less. Compl. Buff. tom. iii. Ois. p. 33 (1837).

Ptilonopus purpureicinctus, Gray, Proc. Zool. Soc. 1853, p. 48, pl. lv; id. List B. Brit. Mus. (1856) p. 4. sp. 5 (partim); id. Ann. & Mag. Nat. Hist. 2nd ser. vol. xv. (1855) p. 159; id. List B. Trop. Isl. (1859) p. 37.

Kurukuru roseicapilla, Des Murs & Prév. Zool. Voy. Vénus, Ois. p. 259 (1855).

Ptilopus roseicapillus, Bon. Compt. Rend. tom. xl. (1855) p. 216. sp. 46; id. Iconog. Pig. (1857) pl. xxii.; id. Consp. Gen. Av. vol. ii. p. 21. sp. 7.

Ptilopus roseicapillus, Gray, List B. Trop. Isl. p. 37; Reich. Taub. p. 96.

Ptilinopus roseicapillus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 127.

Hab. Ladrone Islands or Marianne Islands.

This is a very distinct species, differing in certain particulars from all others known. Besides Lesson's type there are several examples in the collection of the Paris Museum. It is a rare species, not many examples having been brought to Europe.

Adult. Front, crown, and spot at base of lower mandible rich purple, margined on the posterior part with yellow. Back and sides of neck greenish grey. Throat white. Upper part of breast greyish green, the feathers tipped with pearly white. Lower part of breast crossed by a green band, with a large spot of deep purple in the centre; abdomen orange, with the centre yellowish green; under tail-coverts bright yellow, becoming rich orange towards their tips. Back and upper tail-coverts bronzy green. Wings like the back; primaries black on inner webs, green on the outer, edged with yellow, the first one abruptly and greatly attenuated; secondaries bluish green margined with lemon-yellow. Rectrices pale green on outer webs, smoke-colour on their inner, with a broad terminal band of yellowish white. Bill black, tip yellowish. Total length 8¾ inches, wing 5¼, tail 3¼, culmen ½. (Specimen figured by Bonaparte *l. c.* in Paris Museum. Lesson's type of this species is also before me; but not being in so good a condition as Bonaparte's specimen, I have preferred not to take my description from it.)

16. PTILOPUS HUTTONI.

Ptilinopus huttoni, Finsch, Proc. Zool. Soc. 1874, p. 92.

Hab. Island of Rapa or Opara, South Sea.

I do not know this bird autoptically. It is evidently a very fine and distinct species, differing in many ways from all others of this genus. It is quite large, has the first primary attenuated, and also two thirds of the basal portion of the tarsus feathered. As I have shown, however, in the discussion of the genera in the earlier part of this paper, these two characters are not of any especial importance in defining the generic position of the members of the group now under consideration. The following description is taken from that given by Dr. Finsch of the type.

Adult. Front and crown and spot at base of mandible purplish violet-red; chin red, but paler than the crown. Red of crown margined narrowly and indistinctly with green. Occiput, neck, throat, and crop ashy grey tinged with green; feathers on the crop bifurcate, and dull olive-green in the centre. A pale yellowish longitudinal patch below the chin. A large dark purplish-violet patch on the breast; base of feathers dark olive-green. Sides of breast and flanks dark olive-green. Anal region and back of thighs dirty yellow. Under tail-coverts purplish violet-red like the crown, basal portions yellowish. Upper parts dark olive grass-green. Quills dark green, margined narrowly with yellow, with apical portions having coppery reflections. Shoulder-coverts with a triangular spot of dull lilac. Tail-feathers dark green; apical margin yellowish white, with coppery reflections in certain lights. Bill horny grey, tip yellowish; feet pale, apparently yellow; eye pink. Total length 12·20 inches, wing 6·70, tail 4·90; bill above ·75, at gape 1·15; tarsus 1·20; middle toe ·95, nail ·35.

17. PTILOPUS DUPETIT-THOUARSI.

Ptilinope de dupetit-thouars, Hombr. & Jacq. Voy.Pôle Sud, pl. 29. f. 1.

Columba dupetithouarsii, Neboux, Rev. Zool. 1840, p. 289; id. Voy. Favor. pl. 7.

Columba kurukuru purpuro-leucocephalus, Hombr. & Jacq. Ann. Sc. Nat. xvi. p. 316 (1841).

Ptilinopus emiliæ, Less. Echo du Monde Sav. (1844) p. 873.

Ptilonopus leucocephalus, Gray, List B. Brit. Mus. p. 2 (1844), *Gallinæ*.

Ptilonopus dupetit-thouarsi, Gray, Gen. B. vol. iii. App. p. 23 (1844–49); id. List B. Brit. Mus. (1856) p. 3, *Columbæ*; id. B. Trop. Isl. p. 36 (1859).

Ptinilopus dupetit-thouarsi, Jacq. & Puch. Voy. Pôle Sud, vol. iii. (1858), text, p. 114, atl. pl. 29. fig. 1.

Trygon dupetit-thouarsi, Reich. Syst. Av. p. xxvi.

Thouarsitreron leucocephala, Bon. Compt. Rend. tom. xxxix. (1854) p. 276, and tom. xl. (1855) p. 216; id. Iconogr. Pig. (1857) pl. 17; id. Consp. Av. p. 16 (1857).

Columba dupetit-thouarsi, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 241.

Thouarsitreron dupetit-thouarsii, Reich. Tauben, p. 93, pl. 240. fig. 2587.

Ptilinopus dupetit-thouarsi, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 129; Finsch, Proc. Zool. Soc. 1877, p. 410.

Ptilopus dupetit-thouarsii, Schleg. Mus. Pays-B. 1873, p. 15, *Columbæ*.

Hab. Christine Island, Marquesas.

A very handsome species, not likely to be confounded with any other of this group. It has, I believe, only been obtained on Christine Island of the Marquesas. The first primary is especially noticeable for the great length of its attenuation.

Adult. Top of head greyish white, margined faintly with light yellow. Throat and spot in front of the eye light yellow. Neck and upper part of back greyish green. Feathers of the breast pale green tipped with grey. Flanks pale green. Abdomen deep rose-colour; crissum and under tail-coverts bright yellow. Back and upper tail-coverts bronzy green. Wings like the back; primaries black, with a dark green shade on their outer webs, and the innermost ones bronzy green at their tips, the first one abruptly and greatly attenuated. Secondaries—outer ones dark green on their outer webs, dark brown on inner with bronze-green tips, innermost ones deep blue near their tips, and all broadly margined with light yellow. Rectrices dark green (sometimes strongly tinged with bronze), with a broad apical yellowish-white band. Bill black, tipped with yellow. Feet red. Total length $9\frac{5}{8}$ inches, wing 6, tail $3\frac{3}{4}$, culmen $\frac{3}{8}$. (Type of the species from Christine Island.)

18. PTILOPUS XANTHOGASTER.

Columba purpurata, Temm. (nec auct.) Pl. Col. livr. 43 (1824), vide text to pl. 254, livr. 95 (1835).

Columba xanthogaster, Wagl. Syst. Av. (1827) sp. 29, *Columbæ*.

Columba diademata, Temm. text to Pl. Col. 254, livr. 95 (1835).

Ptilinopus purpuratus, Steph. (nec auct.) Cont. Shaw's Gen. Zool. vol. xiv. p. 277. sp. 1.

Ptilinopus flavigaster, Swains. Class. B. vol. ii. p. 347.

Le Kurukuru à ventre jaune, Less. Compl. Buff. tom. iii. Ois. p. 36 (1837).

Ptilonopus xanthogaster, Gray, Gen. B. (1844–49) vol. ii. p. 446; id. List B. Brit. Mus. (1856) p. 5; id. List B. Trop. Isl. p. 36 (1859).

Kurukuru xanthogaster, Des Murs and Prév. Voy. Vénus (1855), Zool. p. 238.

Thouarsitreron diademata, Bon. Compt. Rend. tom. xxxix. (1854) p. 876, tom. xl. (1855) p. 216; id. Iconog. Pig. pl. 18 (1857); id. Consp. Av. vol. ii. p. 16 (1857); Reich. Tauben, p. 93, figs. 1326, 1327.

Ptilonopus diadematus, Wall. Ibis, 1865, p. 380.

Ptilinopus diadematus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 124.

Ptilopus diadematus, Schleg. Mus. Pays-B. 1873, p. 11, *Columbæ*.

Ptilopus xanthogaster, Salvad. Ann. Mus. Civ. Genov. 1876, vol. ix. p. 199.

Hab. Banda (*Reinwardt, Hoedt*); Khoor or Kanaloor, Little Ké, Grand Ké (*Von Rosenberg*); Lettie, east of Timor (*Hoedt*).

This species was first called by Temminck *Columba purpurata*, Lath., in the 43rd livraison of the 'Planches Coloriées,' he supposing that it was a female of Latham's bird. Afterwards he ascertained, from an examination of the specimens obtained by Quoy and Gaimard during the voyage of the 'Uranie,' that the bird figured by him represented a distinct species; and he therefore, in the 95th livraison, issued a new sheet of text calling the bird *diademata*, and requested that the previous page should be replaced by this one. However, between the dates of these two livraisons (1824–1835), Wagler had in 1827, in his 'Systema Avium,' described the species as *xanthogaster*, which name will of course take precedence over Temminck's later one of *diademata*.

Adult. Head, neck, and upper part of the breast greyish white. An orange-yellow line passes over the eye and encircles the occiput. Throat bright yellow. Lower part of breast, abdomen, and under tail-coverts orange-yellow; a large pale grey patch on upper part of abdomen. Upper parts dark green. Centre of tertials, scapulars, and innermost secondaries deep blue, bordered with yellow. Primaries bordered with white, the first one abruptly and greatly attenuated. Tail dark green, with an apical band of lighter green. Bill green,

tip yellow; feet dark red. Total length 9 inches, wing $5\frac{1}{4}$, tail $3\frac{3}{8}$, culmen $\frac{1}{2}$.

19. PTILOPUS CHRYSOGASTER.

Ptilonopus chrysogaster, Gray, Proc. Zool. Soc. 1853, p. 48; id. Ann. & Mag. Nat. Hist. 2nd ser. vol. xv. (1855) p. 158; id. List B. Brit. Mus. (1856) p. 5. sp. 10, *Columbæ*; id. List B. Trop. Isl. p. 36 (1859); Sclat. Proc. Zool. Soc. 1864, p. 9.

Kurutreron chrysogaster, Bon. Compt. Rend. (1854) tom. xxxix. p. 876, (1855) tom. xl. p. 217; id. Iconogr. Pig. (1857) pl. 29. fig. 2; id. Consp. Gen. Av. vol. ii. p. 26. sp. 2 (1857).

Kurutreron chrysogastra, Reich. Taub. p. 92, tab. 245 *b*. figs. 3525, 3526.

Ptilinopus chrysogaster, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 128; Graeffe, Journ. Mus. Godeff. 1873, Taf. 7. fig. 4.

Hab. Tonga-Tabou, Huaheine, Society Islands (*Wodehouse*).

Although distinct, this species is a close ally of the *Pt. xanthogaster*. It can, however, be readily recognized by its bright yellow abdomen and under tail-coverts and light purple crown, those of its relative being orange and greyish white respectively. It is one of the two species known to inhabit the Society Islands.

Adult. Front and crown light-purple, margined posteriorly with dark yellow. Rest of head, neck, mantle, breast, and flanks greenish grey. Throat pale yellow. Abdomen and under tail-coverts bright yellow. Back and wings bronzy grass-green. Primaries black, the outer webs margined with dark green, the first abruptly and greatly attenuated for one third its length; secondaries bluish green, margined with pale yellow. Tail dark bronze-green, with a broad terminal band of yellowish white edged with a bright yellow. Bill black, tip yellow. Feet brown. Total length $9\frac{1}{2}$ inches, wing $5\frac{3}{4}$, tail 4, culmen $\frac{3}{8}$.

20. PTILOPUS TAITENSIS.

Columba kurukuru, var. *taitensis*, Less. Voy. Coq. tom. i. text, p. 297 (1826).

Columba oopa, Wagl. Isis, 1829, p. 742.

Columba taitensis, Less. Trait. Ornith. (1831) p. 472.

Le Kurukuru d'Otaiti, Less. Compl. Buff. tom. iii. Ois. p. 35 (1837).

Colombe de Taiti, Neboux, Rev. Zool. 1840, p. 289.

Ptilonopus taitensis, Gray, Gen. B. vol. ii. p. 466 (1844–49).

Ptilinopus furcatus, Peale, U.S. Expl. Exped. Birds, p. 191 (1848).

Kurukuru purpuratus, Des Murs & Prév. (nec auct.) Voy. Vénus, Zool. p. 222 (1855). Spec. Paris Mus.

Kurukuru dupetit-thouarsi, Des Murs & Prév. Voy. Vénus, Zool. pl. vii. (1855).

Kurukuru nebouxii, Des Murs & Prév. Voy. Vénus, Zool. p. 253 atl. pl. vii.

Kurukuru taitensis, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 251.

Ptilonopus purpuratus, Gray, List B. Brit. Mus. (1856) p. 4 (partim); id. List B. Trop. Isl. (1859) p. 35 (partim); Finsch, Proc. Zool. Soc. 1877, p. 741.

Kurutreron oopa, Bon. Compt. Rend. (1854) tom. xxxix. p. 878; id. Iconogr. Pig. (1857) (text); id. Consp. Av. vol. ii. p. 26; Reich. Taub. p. 92, pl. 245 *b*. figs. 3527–28.

Ptilinopus purpuratus, Cass. U.S. Expl. Exped. (1858) Ornith. pl. xxx. p. 269; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 122; Finsch, Proc. Zool. Soc. 1877, p. 741.

Ptilopus purpuratus, Schleg. Mus. Pays-B. 1873, p. 15, *Columbæ*.

Hab. Otaheiti.

Peale says this species utters a *coo-coo-coo* slowly and at regular intervals. It is not as sprightly as the Coral-Island Dove, and delights to sit on some dead branch in the shady recesses of the woods. In my article on *Pt. purpuratus* I have given my reasons for considering that this species should not bear that name. The fact that Latham states that the bird he describes came from Otaheite, which is the chief reason why his name of *purpuratus* was assigned to this species, loses entirely its value and force when it is seen that no bird of the genus *Ptilopus* inhabits Otaheite that answers to his description. Having specimens from both the Society Islands and Tonga in his possession, and having confused them in his description, he probably did not particularly regard his specimen or compare it with his description when he stated it to have come from Otaheite. By no stretch of the imagination can the present species be deemed to have a "purple crown." It is *ashy grey with a lilac tinge*, but in no way does it approach any shade of purple. A series of specimens now before me from the Paris-Museum collection clearly substantiates this.

Adult. Top of head ash-grey with a tinge of lilac. Underparts light ash-green, darkest on the abdomen. Back of neck cinereous, washed with green. Upper parts bright green. Wings bright green; first primary gradually narrowed to tip; the inner webs of secondaries and primaries black, outer webs bright green, those of the secondaries edged with yellow. Centre of abdomen and crissum pale yellow, becoming bright yellow on the under tail-coverts. The tail has the rectrices bright green on the outer webs, black on the inner, and a subterminal interrupted greyish bar, extending only over the inner webs. Feet violet; eyes orange; bill green at base, tip yellow. Feet brown. Total length 9 inches, wing $5\frac{3}{4}$, tail $3\frac{5}{8}$, culmen $\frac{1}{2}$.

21. PTILOPUS SUPERBUS.

Columba superba, Temm. Pig. & Gall. tom. i. p. 277 (1813); Shaw, Gen. Zool. vol. xi. pt. 1, p. 64 (1819); Desm. Dict. Sc. Nat. vol. xl. (1826) p. 337; Temm. & Knip, vol. i. pl. 33.

Columba cyanovirens, Less. Voy. Coq. pl. xlii. fig. 1 (1824); Desm. Dict. Sc. Nat. vol. xl. (1826) p. 343; Less. Trait. Ornith. (1831) p. 471; Knip & Prév. Pig. vol. ii. pl. 8, ♀.

Columba superba, Wagl. Syst. Av. (1827) sp. 32, *Columba*.
La Verte, Less. Compl. Buff. tom. iii. Ois. p. 29 (1837).
La Poukiopou, Less. Compl. Buff. tom. iii. Ois. (1837).
Ptilinopus leucogaster, Swains. Class. B. vol. ii. p. 347.
Ptilinopus superbus, Steph. Gen. Zool. vol. xiv. p. 279. sp. 6; Gould, B. Austr. vol. v. pl. lvii.
Ptilonopus superbus, Gray, Gen. B. (1844–49) vol. ii. p. 467; id. List B. Brit. Mus. (1856) p. 7; id. Proc. Zool. Soc. 1858, p. 184; id. List B. Trop. Isl. (1859) p. 39; id. List Mamm. and B. New Guin. (1859) p. 46; Wall. Ibis, 1865, p. 379; Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 786.
Ptilonopus cyanovirens, Gray, Gen. B. (1844–49) vol. ii. p. 467; id. List B. Brit. Mus. (1856) p. 8. sp. 23; id. Cat. Mamm. and B. New Guin. (1859) p. 47.
Kurukuru superbus, Des Murs & Prév. Voy. Vénus, p. 231 (1855).
Lamprotreron superba, Bon. Consp. Gen. Av. (1857) vol. ii. p. 18; Reich. Tauben, p. 97, pl. 236 *b*. fig. 3366, ♀, pl. 236. figs. 1316–17, ♂ juv.; Ibis (1866), p. 333; Ramsay, Proc. Zool. Soc. 1876, p. 114.
Cyanotreron cyanovirens, Bon. Compt. Rend. (1854) tom. xxxix. p. 878; id. Consp. Av. vol. ii. p. 23; Reich. Tauben, p. 98, pl. 238. fig. 1324.
Ptilonopus (*Lamprotreron*) *superbus*, Gray, Proc. Zool. Soc. 1860, p. 360.
Ptilopus superbus, Schleg. Mus. Pays-B. 1873, p. 30, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1877) vol. x. p. 158.
Lamprotreron porphyrostictus, Gould, Ann. & Mag. Nat. Hist. (1874) vol. xiii. p. 137, ♀ ?

Hab. Amboyna, Ceram, Batchian, Gilolo, Waigiou, Mysol, Aru, New Guinea (*Wallace*); Mount Arfak (*Bruijn.*); Halmahera, Ternate, Batanta, Jobie (*Bernstein, Von Rosenberg*); Bouru, Salwatty (*Hoedt*); Amberbaki, Mafor (*Raffray*); New Hanover (*Cabanis*); Booby Islands (*Gould*); Cape York, Australia (*Cockerell*).

As will be seen from the list given above, this species has received many names. The two sexes have been described as distinct species, and have been assigned to different genera! It has a wide distribution, having been procured as far to the eastward as New Hanover, reaching Gilolo on the north, and Cape York, Australia, on the south. In fact it is found generally throughout the Papuan group of islands and along the northern part of New Guinea. As it has been obtained at Mount Arfak and Amberbaki, and also on Salwatty on the west coast, it will be probable that it will be ascertained to inhabit the entire northern portion of New Guinea. According to Mr. Ramsay, this bird is tolerably abundant in the scrub-lands of the Herbert River and coast-range. The note, which is a rolling guttural "coo," may be heard half a mile off. The young resemble somewhat those of *Pt. swainsoni* (*regina*), but do not show the bifurcate breast-feathers before the end of the second year; but the green bands on the flanks are conspicuous even in the nestling. The

Lamprotreron porphyrostictus of Gould seems to be only a female of this species, having "a purplish-blue spot at back of head."

Adult male. Upper part of head bright purple. Ear-coverts and sides of face light green. Chin and throat ashy white. Nape and sides of neck above shoulders rufous-orange. Breast has the feathers light purple at the base, broadly tipped with ashy grey, this latter hue giving the predominant colour to the breast. A broad bluish-black band crosses the lower part of the breast. Middle of abdomen and crissum white. Flanks and thighs green, the former crossed by a white band above the thighs. Upper parts bright green. Shoulders and a spot on the scapulars, wing-coverts, and secondaries deep purple. Primaries brownish black, the first abruptly attenuated. Secondaries bright green, edged with light yellow. Tail has the rectrices blackish on the inner webs, bright green on the outer, and all except the central pair with a white apical band. Under tail-coverts white, tinged with yellow, with broad central green stripes. Bill olive-green, tip yellowish. Feet pink; claws pale. Iris yellow.

Total length 9½ inches, wing 5½, tail 4, culmen ⅝.

Specimen described from Ternate. Amboyna examples seem to be bright pale orange on the nape and sides of neck.

Female. Uniform green above. A spot of deep greenish blue on the occiput. Throat greyish white; breast greyish green. Middle of abdomen white.

Young. Uniform yellowish green, tinged with grey upon the breast.

22. PTILOPUS TEMMINCKI.

Columba superba, Knip & Prév. Pig. tab. 42, ♀, ex Celebes (1838).

Kurukuru temminckii, Des Murs & Prév. Voy. Vénus, p. 234 (1855).

Ptilonopus formosus, Gray, Proc. Zool. Soc. 1860, p. 360; Wall. Ibis, 1865, p. 379; Wald. Trans. Zool. Soc. vol. viii. (1872) p. 82.

Ptilopus superbus, Schleg. Mus. Pays-B. 1873, p. 32, *Columbæ*, ex Celebes.

Megaloprepia formosa, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 199.

Hab. Celebes.

This form, from the island of Celebes, possesses quite sufficient difference in coloration to entitle it to be considered distinct from *Pt. superbus*. The nape and sides of the neck are a much brighter orange; and the lower part of the breast is pale purple, graduating insensibly into the bluish-black band that crosses the body above the abdomen. An immature bird of this species from Celebes was figured by Knip & Prévost (*l. c.*) as the female of *Pt. superbus*; but afterwards, convinced that it represented a distinct species, they called it *temminckii* in the Voyage of the Vénus (*l. c.*), which name antedates the *formosus* of Gray. The figure originally published by these authors does not represent well the differences existing between this species and *Pt. superbus*, on account of the specimen not having yet assumed its perfect livery; but the locality, Celebes, proves

that their bird cannot belong to the older known form. Gray did not well indicate the distinctive characters of this species in the 'Proceedings' of this Society when he conferred a name upon it (*l. c.*); but it was properly and completely described by Wallace afterwards in 'The Ibis' (*l. c.*). It can readily be distinguished from its ally by the purple breast, the general plumage of the two species being the same, as are also the dimensions.

The female resembles that of *Pt. superbus*, with rather a deeper coloration.

23. PTILOPUS PEROUSEI.

Ptilopus perousei, Peale, U.S. Expl. Exped. (1848) p. 195, pl. 54; Cassin, ibid. (1858) 2nd ed. p. 274, pl. 33; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 110; id. Proc. Zool. Soc. 1869, p. 548; Finsch, Journ. für Ornith. 1872, p. 44; Schleg. Mus. Pays-Bas 1873, p. 10, *Columbæ*.

Ptilinope de Marie, Hombr. & Jacq. Voy. Pôle Sud, pl. 29. fig. 2.

Columba kurukuru superba, Hombr. & Jacq. Ann. Scien. Nat. (1841) tom. xvi. p. 316.

Ptinilopus mariæ, Jacq. & Puch. Voy. Pôle Sud (1853), tom. iii. p. 115.

Kurukuru samoensis, Des Murs & Prév. Voy. Vénus, Zool. p. 247. Type examined.

Ptilopus mariæ, Bon. Compt. Rend. (1854) tom. xxxix. p. 877; id. Iconog. Pig. (1857) pl. 26, ad. et juv.; id. Consp. Av. vol. ii. p. 22. sp. 10.

Ptilonopus mariæ, Gray, List Columb. (1856) p. 4; Reich. Tauben, p. 96, pl. 240. fig. 2586; id. List B. Trop. Isl. p. 37 (1859).

Ptilinopus cæsarinus, Hartl. Journ. für Ornith. 1864, p. 413, juv.

Ptilinopus perousei, Cass. Expl. Exped. (1858) p. 274, pl. 33; Reich. Tauben, Supp. p. 203, nov. taf. 38–40; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 110, t. xi. fig. 1; Gräffe, Journ. für Ornith. 1870, pp. 122 & 408; Finsch, Journ. für Ornith. 1872, p. 44.

Ptilinopus mariæ, Finsch & Hartl. Journ. für Ornith. 1870, p. 131.

Ptilonopus perousei, Whitmee, Ibis, 1875, p. 441.

Hab. Ovalau (*Filhol*); Upolu, Hapai (*Gräffe*); Samoan Islands, Viti-Levu (*Gräffe*); Wakaia, Mokani, Vanua Levu, Loma Loma, Kandavu, Mango (*Layard*); Fiji Islands; Tonga or Friendly Islands.

This species was first described by Peale (*l. c.*) under the name here adopted, and afterwards by Hombron and Jacquinot (*l. c.*) as "Ptilinope de Marie," still later latinized by Jacquinot and Pucheran (*l. c.*) as *Ptinilopus! mariæ*. Peale's appellation, however, has undoubted priority. Mr. Peale found it in the mountain-gorges of the Feejee Islands, but not abundant. The native name, *Manu-ma*, means shame or modest bird. It is one of the most beautiful and curiously marked members of this genus. The young are so differently coloured from the adult that they might easily be mistaken for a different species.

Adult. Front and crown, and a broad band across the back, dark purplish red. Head, neck all around, and throat white with a wash of yellow. Feathers of the breast, split at their ends, have their basal half rose-red, apical portion yellowish white; beneath these feathers is a reddish-orange band. Abdomen, flanks, and crissum yellowish white. Under tail-coverts dark purplish red. Back and upper tail-coverts pale greenish yellow. Wings pale grey, feathers margined with greenish yellow. Primaries and secondaries dark bronzy green; first primary abruptly attenuated. Tail greyish white. Bill black, with the tip yellow. Feet black.

Total length $8\frac{5}{8}$ inches, wing $5\frac{1}{4}$, tail $3\frac{1}{4}$, culmen $\frac{3}{8}$.

Immature. Front and crown deep rosy purple. Cheeks grey. Upper parts shining golden green. Throat white. Breast green, feathers tipped with white. Abdomen and crissum yellowish white. Under tail-coverts bright yellow. Wings shining golden green; primaries and secondaries margined with yellow. Tail golden green, very bronzy on the edges and tips of the feathers. Bill and feet as in the adult. (Four specimens before me, all of which lack the purple bar on the breast shown in the figures of Bonaparte and Hartlaub and Finsch.)

24. PTILOPUS CORONULATUS.

Ptilonopus coronulatus, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 138; id. List Mamm. & Birds, New Guinea (1859), p. 45; Wall. Ibis, 1865, p. 378; Schleg. Mus. Pays-Bas 1873, p. 9, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 833.

Ptilopus coronulatus, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Aru Islands (*Wallace, Rosenberg*); Salwatty and Sorong, (*Bernstein*); Jobie (*Rosenberg*); Yule Island (*D'Albertis*).

This species and the two next mentioned form a small section of this genus, related closely to each other in the distribution of the hues of their plumage. Like so many others of the genus, they are conspicuous for their brightly-coloured crowns and abdomens.

Male. Front and crown pink, bordered posteriorly by a narrow line of purple, succeeded by a broader one of bright yellow. A purple spot on the upper part of the abdomen; middle of abdomen, crissum, and under tail-coverts bright yellow. Entire rest of plumage bronzy green. Secondaries and primaries margined with yellow. First primary abruptly attenuated at tip. Bill greenish yellow. Feet red. Iris orange.

Total length $7\frac{1}{2}$ inches, wing $4\frac{3}{4}$, tail $2\frac{3}{4}$, culmen $\frac{3}{8}$.

Female like the male.

25. PTILOPUS GEMINUS.

Ptilonopus geminus, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 786.

Ptilonopus senex, Brügg. Abhandl. natur. Ver. Brem. 1876, p. 82.

Ptilopus geminus, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Jobie (*Von Rosenberg, Bruijn*); Krudu (*Beccari*); New Guinea, near Dorey (*Bruijn*); Ansus (*Salvadori*).

This is a species apparently entitled to be considered distinct from the *Pt. coronulatus*. It differs by having the front and crown pinkish white, and the upper part of the abdomen around the violet spot saffron-yellow. The cheeks are also a dark greenish grey. First primary abruptly attenuated at tip. Size the same as *Pt. coronulatus*. Prof. Schlegel, in Mus. Pays-Bas, was the first to point out the differences existing between these two birds, but did not deem them of specific importance; and Dr. Salvadori bestowed the name here adopted.

26. PTILOPUS TRIGEMINUS.

Ptilonopus trigeminus, Salvad. Ann. Mus. Civ. Gen. vol. vii. (1875) p. 787.

Ptilonopus marginalis, Brügg. Abhandl. natur. Ver. Brem. 1876, p. 82.

Ptilopus trigeminus, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Salwatty (*Von Rosenberg*); New Guinea, near Sorong (*Bernstein*).

The claims of this form to be considered distinct from the last are based upon very slight grounds; and it may well be doubted if it should be separated from *Pt. geminus*. The only difference is in the slightly paler crown. At best it seems to be but a local race of the preceding species.

27. PTILOPUS IOZONUS.

Ptilonopus iozonus, Gray, Proc. Zool. Soc. 1858, p. 186; id. List Mamm. & Birds New Guin. (1859) p. 46; Wall. Ibis, 1865, p. 378.

Ptilopus iozonus, Schleg. Mus. Pays-B. 1873, p. 17, *Columbæ*; id. Nederl. Tijdsch. Dierk. tom. iv. p. 25 (1873); Meyer, Rowl. Ornith. Misc. pt. ix. p. 342.

Ptilonopus ionozonus, Salvad. Ann. Mus. Civ. Gen. vol. vii. (1875) p. 834.

Ptilopus ionozonus, Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876) p. 198.

Hab. Aru (*Wallace, Von Rosenberg*); New Guinea (*D'Albertis*).

We have here, in this species and its two relatives, another small section of this genus. One of their chief differences is the arrangement of the colours on the margin of the wing, and another the manner in which the terminal band on the tail is exhibited. Although closely allied, the species seem to be quite distinct, their geographical distribution also giving strength to this view.

Male. Yellowish green. Bend of wing greyish violet, mixed with green. Middle of the abdomen deep orange. Vent and under tail-

coverts white, varied with yellow. Greater wing-coverts and tertials bordered with yellow, the latter grey in the middle of each feather. Quills shining deep emerald-green, first one gradually narrowed to the tip. Under surface of wings slate-colour. Tail green, with a broad band of grey at the tip, which is white beneath, especially on the inner webs.

Length 8″ 3‴; wings 4″ 9‴ (*Gray, l. c.*).

Female with a patch on the abdomen of an orange-yellow.

28. PTILOPUS HUMERALIS.

Ptilonopus humeralis, Wall. Proc. Zool. Soc. 1862, p. 166.

Ptilopus humeralis, Meyer, Proc. Zool. Soc. Soc. 1862, pl. 21; Schleg. Mus. Pays-B. (1873) p. 16, *Columbæ*; id. Nederl. Tijdsch. Dierk. tom. iv. p. 24 (1873); Meyer, Rowl. Ornith. Misc. p. 342, pt. ix.; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Salwatty and adjacent coasts of New Guinea (*Wallace*); Sorong (*Bernstein*); Salwatty and Mansinam (*Meyer*).

This bird is easily distinguished from its immediate allies by the deep-purple band on the shoulder. It apparently ranges across the northern part of New Guinea, having been procured, as will be observed, from Mansinam, on the mainland, in the Bay of Geelvink, to Sorong, on the west coast, and also on Salwatty, opposite Sorong.

Adult male. General plumage bright green. Middle of abdomen rich orange. Crissum and under tail-coverts bright yellow. Shoulders violet-grey, bounded beneath by deep purple. Wing-coverts violet-grey, margined with green. Secondaries margined with yellow. Primaries dark green, the first sharply narrowed towards the tip. Tail bright green above, dark grey beneath, with an apical whitish band. Bill greenish, tipped with yellow; base above red and swollen. Feet purplish red.

Total length $8\frac{3}{4}$ inches, wing $4\frac{7}{8}$, tail $2\frac{1}{2}$, culmen $\frac{5}{8}$.

29. PTILOPUS JOBIENSIS.

Ptilopus humeralis jobiensis, Schleg. Mus. Pays-B. 1873, p. 16, *Columbæ*; Rowl. Ornith. Misc. pt. ix. pp. 340, 348, pl.; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Island of Jobie.

This species, a close relative of *Pt. humeralis*, has as yet only been found upon the island of Jobie, in the great Bay of Geelvink, New Guinea. It differs chiefly from the species just named in the coloration of the shoulders of the wing, which are violet-grey, without any purple; and the tail is uniform green above, without the apical grey band.

Adult. General plumage yellowish green. Abdomen rich orange. Crissum and under tail-coverts white, the latter tipped with yellow. Shoulders violet-grey. Wing-coverts violet in the centre, surrounded by greenish blue, and margined with green. Primaries and secondaries dark green, the latter edged with yellow; first primary nar-

rowed at tip. Tail bronzy green above, beneath black, with an apical greyish-white band. Bill black, tip yellow. Feet red.

Total length 7¼ inches, wing 4¾, tail 2¼, culmen ⅝.

30. PTILOPUS INSOLITUS.

Ptilopus insolitus, Schleg. Nederl. Tijdsch. (1861) vol. i. p. 61, pl. 3. fig. 3.

Ptilopus humeralis jobiensis (monstr.?), Schleg. Mus. Pays-B. 1873, p. 16, *Columbæ*.

Œdirhinus globifer, Cab. & Reich. Sitzungsb. Gesellsch. nat. Freunde Berlin 1876, p. 73; id. Journ. für Ornith. 1876, p. 326.

Œdirhinus insolitus, Sclat. Proc. Zool. Soc. 1877, p. 110; Salvad. Proc. Zool. Soc. 1877, p. 196.

Hab. New Ireland (*Huesker*); Duke-of-York Island (*Brown*).

This strange and attractive species was first described by Schlegel (*l. c.*). He afterwards, on account of the protuberance on the forehead, imagined it was only a monstrosity of the *Pt. jobiensis*. This, however, is not the fact, as the species is very distinct. The locality given by Schlegel (New Caledonia) is probably an error, as the bird has lately been received from both New Ireland and Duke-of-York Island. Cabanis and Reichenow have made a new genus for the reception of this bird, "*Œdirhinus*," on account of the swelling of the forehead. I have not adopted this term; for the division does not seem to me to be necessary. The same peculiarity exists in species of *Carpophaga*, viz. *C. tumida* and *C. rubricera* and others; and if it is a sufficient cause to separate *Pt. insolitus* from the members of the genus *Ptilopus*, the species above mentioned should also be generically divided from *Carpophaga*, a proceeding which is hardly likely to meet with favour. Nothing is known about the habits and economy of the present species. In the arrangement of the group it naturally comes next to the *Pt. jobiensis*.

Adult. Head, neck, back, breast, and flanks bright bronzy green. Throat green, slightly tinged with grey. Abdomen deep orange. Shoulders and a patch on each side of the back at the edge of the mantle light grey. Wings green; secondaries margined with bright yellow on their outer webs; inner secondaries light grey, margined with green. Tail bright green, with the apical third ashy grey. Crissum and under tail-coverts bright yellow. Bill greenish at base, yellowish at tip. Forehead and base of culmen covered by a bony protuberance large and rounded in form, very conspicuous, and of a red colour. Tarsi and feet red.

Total length 9¼ inches, wing 5, tail 3, bill at gape ¾.

31. PTILOPUS NANUS.

Columba Naina, Temm. Plan. Col. no. 565; Knip & Prév. Pig. vol. ii. pl. 59.

La Naine, Less. Compl. Buff. tom. iii. Ois. p. 30 (1837).

Ptilonopus naina, Gray, Gen. B. vol. iii. p. 467 (1844–49).

Iotreron nana, Bon. Consp. Gen. Av. vol. ii. p. 25 (1857).

Ionotreron nana, Reich. Taub. p. 100, Taf. 239. fig. 1330.

Ptilonopus nanus, Gray, List Mamm. & B. New Guinea (1859), p. 46; Wall. Ibis 1865, p. 381.

Ptilopus nanus, Schleg. Mus. Pays-B. (1873) p. 21, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 196.

Hab. Triton Bay, New Guinea (*Müller*); Mysol (*Hoedt*).

This is the smallest species of this genus, and one of the most attractive. It is very rare in collections, but few specimens having been procured since it was first described by Temminck (*l. c.*). It is conspicuous among its relatives from having all the wing-coverts tipped with yellow, and from the blue-grey bands on each side of the breast.

Male. General plumage bronzy green. Large band of bluish grey on each side of the breast. A purple spot on the centre of the abdomen. Wing-coverts, scapulars, and tertials tipped with yellow, a greenish-blue shade behind the yellow on the last two. Feathers of the legs whitish. First primary narrowed at tip.

Wing 2 inches 11 lines, tail 1 inch 6 lines.

Female. Green, without abdominal spot.

32. PTILOPUS MONACHUS.

Columba monacha, Temm. Pl. Col. 253; Desm. Dict. Sc. Nat. tom. xl. p. 344 (1826); Knip & Prév. Pig. pl. 53; Wagl. Syst. Av. (1827) sp. 35.

Ptilinopus monachus, Steph. Shaw, Gen. Zool. vol. xiv. (1826) p. 277. sp. 2; Swains. Class. B. vol. ii. p. 347 (1837).

La Monache, Less. Compl. Buff. tom. iii. Ois. p. 29 (1837).

Ptilonopus monachus, Gray, Gen. B. vol. ii. p. 466. sp. 8 (1844–49); Wall. Ibis, 1865, p. 378; Salvad. Ann. Mus. Civ. Genov. vol. vii. p. 786 (1875).

Cyanotreron monacha, Bon. Consp. Gen. Av. vol. ii. p. 24 (1857); Reich. Taub. p. 98, Taf. 236. figs. 1314, 1315.

Ptilonopus (*Cyanotreron*) *monachus*, Gray, Proc. Zool. Soc. 1860, p. 359.

Ptilopus monachus, Schleg. Mus. Pays-B. (1873) p. 12, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Batchian, Kaisa, Ternate, Gilolo, Morty (*Wallace*); Motir, Dammar (*Bernstein*); Tidore (*Raffray*).

A series of this bird from different localities brought by M. Raffray is now before me. I notice that those from Ternate differ from Gilolo specimens, as well as those from Tidore &c., in being of larger size, and also in having the blue spot of greater extent and situated upon the *abdomen*, and not on the *breast*, as in those from Gilolo. The type of *Pt. monachus* was erroneously stated to have come from Celebes. A specimen in the Paris collection was obtained in exchange from M. Temminck, and the locality given as Celebes. This agrees precisely with Ternate examples, and has the blue patch upon the abdomen. Temminck's figure in the 'Planches Coloriées' exhibits this large abdominal patch very clearly. The Gilolo birds may require separation.

Adult male. Front, crown, lores, moustache, and a spot on the breast greyish blue. Superciliary stripe, chin, and throat, lower part of abdomen, and under tail-coverts lemon-yellow. Rest of plumage of body bright green. Primaries and secondaries black on inner, green on outer webs, edged with white or pale green; first primary abruptly attenuated at tip. Tail bright green, with a subterminal bar of darker green. Bill greenish, tip lighter; iris dark; feet red.

Total length 7 inches, wing 4, tail $2\frac{1}{2}$, culmen $\frac{3}{8}$.

Female differs in having the front and top of head greenish blue, the throat only slightly tinged with yellow, no spot on the breast, rest of plumage like the male but all the colours much duller.

33. Ptilopus pulchellus.

Columba pulchella, Temm. Pl. Col. 564; Knip & Prév. Pig. vol. ii. t. 14.

La Mignonne, Less. Compl. Buff. tom. iii. Ois. (1837).

Ptilonopus pulchellus, Gray, Gen. B. vol. ii. (1844) p. 466. sp. 7; id. Cat. Mamm. Birds New Guin. (1859) p. 44; Reich. Tauben, p. 96, pl. 236. fig. 1311; Wall. Ibis, 1865, p. 378; Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) pp. 786, 833.

Ptilopus pulchellus, Bon. Consp. Gen. Av. vol. ii. p. 22 (1857); Schleg. Mus. Pays-B. 1873, p. 2, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198, & vol. x. (1877) p. 158.

Hab. New Guinea, Salwatty, Waigiou (*Bernstein*); Mysol (*Wallace*); Amberbaki, Andai (*Raffray*); Monte Epa, New Guinea (*D'Albertis*).

A very brightly coloured and charming little species. From the localities in which it has been procured, we should judge its range was the northern part of New Guinea, with some of the islands lying off the west coast. Its synonymy is very simple, the species never having received a second name.

Male. Front and crown bright carmine. Sides of head and neck, together with the breast, light grey. Chin, throat, and lores white. A large spot or bar of purplish red on the lower part of the breast. Flanks green. Abdomen orange, shading into deep yellow upon the lower parts and crissum. Under tail-coverts orange. Entire upper parts and back of neck bright green. Wings green; primaries and secondaries black on inner webs, green on outer, those of the secondaries edged with yellow; first primary abruptly attenuated at tip. Tail bright green. Bill yellow, tip greenish yellow. Feet dull carmine. Iris orange, paler within. Eyelids yellow.

Total length 8 inches, wing $4\frac{1}{4}$, tail $3\frac{1}{8}$, culmen $\frac{7}{16}$.

There is no difference between the sexes in plumage.

34. Ptilopus melanocephalus.

Columba melanocephala, Gmel. Syst. Nat. tom. i. p. 781 (1788); Temm. Pig. & Gall. tom. i. (1813) p. 263; Horsf. Trans. Linn. Soc. 1821, vol. xiii. p. 182; Wagl. Syst. Av. (1827) *Columba*,

sp. 33; Temm. Pl. Col. 214; Knip & Temm. Pig. vol. i. pl. 30; Less. Trait. Ornith. (1831) p. 471.

Tourterelle de Batavia, Buff. Plan. Enlum. 214.

Columba melanocephala, Shaw, Gen. Zool. vol. xi. pt. 1 (1819).

Ptilinopus melanocephalus, Steph. Shaw, Gen. Zool. vol. xiv. p. 279. sp. 7; Wall. Ibis, 1865, p. 381.

Le Turgis, Less. Compl. Buff. tom. iii. Ois. p. 26 (1837).

Ptilonopus melanocephalus, Gray, List B. Brit. Mus. (1844) p. 1, (1856) p. 6. sp. 15; id. Gen. B. vol. ii. p. 467 (1844–49).

Ionotreron melanocephala, Reich. Taub. p. 100, Taf. 237. figs. 1318, 1319.

Iotreron melanocephala, Bon. Consp. Gen. Av. vol. ii. p. 24. sp. 2 (1859).

Ptilopus melanocephalus, Schleg. Nederl. Tijdsch. Dierk. vol. iii. p. 207; id. Mus. Pays-B. 1873, p. 28, *Columbæ*.

Ptilopus melanauchen, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 670 (ex Flores).

Iotreron melanocephala, id. ibid. p. 671.

Hab. Java (*Diard, Temminck*); Sumbawa, Flores (*Forstein, Rosenberg*); Sulabessie (*Hoedt*); Lombock (*Wallace*).

Count Salvadori has called the birds from Flores (*l. c.*) *Ptilopus melanauchen*; but I really cannot see that this island form differs sufficiently from typical *Pt. melanocephalus*, ex Java, to require separation as a distinct species. It would seem that *four* races of this style of *Ptilopus* are quite sufficient to indicate the varieties that exist. This species is one of the longest-known in the genus; and while the typical style is confined to Java and the Timor group of islands, representative forms, constituting races if not distinct species, are met with on other islands of the Malay archipelago.

Male. Top and sides of head and neck, and lower part of throat light grey; occiput and back of neck black; chin and throat yellow; crissum and short under tail-coverts rich yellow, long ones carmine; entire rest of plumage bright green; primaries black on inner web, green on outer; first primary slightly scalloped and narrowed at tip; bill yellow, greenish horny at the tip; feet pink-red; orbits bare, green.

Total length 9⅜ inches, wing 4½, tail 3, culmen ½. (Java.)

Female. Entirely green, with the exception of the longest feathers of the under tail-coverts, which are carmine, like those of the male.

35. PTILOPUS MELANOSPILUS.

Ptilopus melanocephalus, Schleg. Mus. Pays-B. 1873, p. 29, ex Celebes.

Iotreron melanospila, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 670.

Ptilinopus melanocephalus celebensis, Brügg. Brem. Abhandl. (1876) p. 80.

Hab. Celebes.

The various forms of *Pt. melanocephalus* were pointed out by

Prof. Schlegel (*l. c.*), and names afterwards given to them by M. Salvadori. The principal difference between examples from Celebes and Java appears to be that the former have a much narrower throat-mark, which is lemon-yellow washed with orange.

36. Ptilopus chrysorrhous.

Ptilopus melanocephalus, Wall. Proc. Zool. Soc. 1862, p. 344; Schleg. Mus. Pays-B. 1873, p. 29, ex Sula.

Iotreron chrysorrhoa, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 671.

Ptilonopus sulaensis, Brügg. Abhandl. natur. Ver. Brem. 1876.

Hab. Sula, Ceram (*Bernstein*).

This form has the throat-mark as in specimens from Celebes. The black band on the occiput is smaller, and the abdomen orange-yellow. The characters it offers to support its claim to a distinct rank are not very striking; and it may be questioned if it should be really separated from *Pt. melanocephalus*.

37. Ptilopus xanthorrhous.

Ptilopus melanocephalus, Schleg. Mus. Pays-B. 1873, p. 29, ex Sanghir.

Iotreron xanthorrhoa, Salvad. Mus. Civ. Gen. vol. vii. (1875) p. 670.

Ptilinopus nuchalis, Brügg. Brem. Abhandl. 1876, p. 80.

Hab. Island of Sanghir.

This well-marked race of *Pt. melanocephalus* differs, both in size and colour of plumage, so much that, more than any of the other styles, it deserves a separate name. The colour of the throat is of a deeper yellow; and both abdomen and crissum are orange; and this colour runs up nearly to the breast instead of being confined to the short under tail-coverts and crissum. It is much larger than any of the other races.

Male. Head and neck pearly white. Occiput and back of neck jet-black. Throat orange-yellow. Abdomen and crissum bright orange; long feathers of the under tail-coverts rich carmine. Entire rest of plumage bright yellowish green. Primaries and secondaries margined on their outer webs, near the tips, with lemon-yellow. First primary gradually narrowed towards tip. Bill black, tipped with yellow. Feet very dark red.

Total length 10 inches, wing $5\frac{1}{4}$, tail $3\frac{3}{4}$, culmen $\frac{3}{4}$.

Female. Entirely green. Feathers of the abdomen tipped with yellow. Some feathers of the under tail-coverts tipped with yellow, others with carmine. Bill black. Feet dark red.

38. Ptilopus porphyreus.

Columba porphyrea, Temm. Pl. Col. 106 (1824); Knip & Prév. Pig. vol. ii. pl. iv.; Less. Trait. Ornith. (1831) p. 472.

Ptilinopus porphyreus, Swains. Zool. Journ. vol. i. p. 474 (1824–25); Steph. Shaw, Gen. Zool. vol. xiv. (1826) p. 277. sp. 3.

Columba roseicollis, Wagl. Syst. Av. (1827), *Columba*, sp. 30.
La Porphyre, Less. Compl. Buff. tom. iii. Ois. (1837).
Ptilonopus erythrocephalus, Swains. Class. B. vol. ii. p. 347 (1839).
Ptilonopus roseicollis, Gray, Gen. B. vol. ii. p. 467 (1844–49); id. List B. Brit. Mus. (1844) p. 1, (1856) p. 8.
Ptilopus porphyrea, Reich. Taub. p. 97, pl. 237. figs. 1322–23.
Ptilonopus porphyreus, Wall. Ibis, 1865, p. 380.
Ptilopus porphyreus, Schleg. Mus. Pays-B. 1873, p. 33, *Columbæ*.
Hab. Java (*Wallace, Diard*).

This is a rather large and brightly plumaged species, with a long square tail, approaching somewhat in form *Pt. cinctus*, *Pt. bernsteini*, &c. The first primary is abruptly attenuated at the tip. It is apparently restricted to Java, all the specimens that I have seen having come from that island. There is considerable difference in the colour of the plumage of the adult and young, the latter almost entirely wanting the rose or carmine on the head and breast which makes the adult so conspicuous. There does not appear to be any difference in the plumage of the sexes.

Adult. Head rose-colour, graduating into carmine upon the neck and breast. Beneath the red colour on the breast is a rather broad white band, below which is another of blackish green. Abdomen and flanks clear grey. Thighs and crissum bright green, feathers tipped with bright yellow. Under tail-coverts greenish on the inner webs, white on the outer, with the margins light yellow. Entire upper parts dark yellowish green, lightest on the rump. Primaries black, the first abruptly attenuated at tip. Tail dark green, with a broad dull grey apical band. Bill black, with pale tip. Feet red.

Total length 11 inches, wing $5\frac{3}{4}$, tail $4\frac{1}{4}$, culmen $\frac{5}{8}$.

Young. Have a generally green plumage, with the feathers margined with yellow, and the breast mottled with purplish red.

39. PTILOPUS JAMBU.

Columba jambu, Gmel. Syst. Nat. (1788) vol. i. p. 784; Raffl. Trans. Linn. Soc. (1822) vol. xiii. p. 212; Wagl. Syst. Av. (1827) sp. 28, *Columba*.
Columba jambos, Lath. Ind. Ornith. (1790) vol. i. p. 598. sp. 18; Less. Trait. Ornith. (1831) p. 472.
Columba jamboo, Temm. Pig. et Gall. (1813) p. 257; Temm. & Knip, Pig. vol. i. pl. 27 ♀, 28 ♂; Shaw, Gen. Zool. vol. xi. pt. 1 (1819), p. 49.
Le Jambou, Less. Compl. Buff. tom. iii. Ois. p. 27 (1837).
Ptilonopus jambu, Gray, List B. Brit. Mus. (1844) p. 2, (1856) p. 7. sp. 18; id. Gen. B. vol. ii. p. 467 (1844); Sclat. Proc. Zool. Soc. 1863, p. 221; Wall. Ibis, 1865, p. 378.
Ramphiculus jambu, Bon. Consp. Gen. Av. vol. ii. p. 17 (1857); Moore, Proc. Zool. Soc. 1859, p. 465; Reich. Taub. p. 99, pl. 239. figs. 1334–35 ♂, pl. 244. figs. 3488–89 ♀.
Ptilopus jambu, Schleg. Mus. Pays-B. 1873, p. 36, *Columbæ*.
Native name *Punei-chitrah* in Borneo (*Motley*).
Hab. Malacca (*Wallace*); Sumatra (*Müller*); Borneo (*Motley*);

Luzon, Philippines (*Crockewit*); Busan and Bintulu, Borneo (*Everett*).

This bird, although very plentiful at Banjermassing, is, according to Mr. Motley, rare in other parts of Borneo. It feeds on fruits, particularly of the different species of *Ficus*. Quite different in its style of coloration, it cannot be confounded with any other species of *Ptilopus*. Of late hundreds of specimens have been sent to Europe to be cut up to decorate ladies' bonnets. I saw only lately a box, at least three feet square, full of these birds, which were condemned to be torn to pieces in order to supply the demand this unfortunate fashion has created.

Adult male. Front, crown, and sides of face in front scarlet, the top of head in some lights having an amethyst shade. Upper part of throat and chin black. Sides of neck, from just below the eye, lower part of throat, and entire underparts pure white, washed with rose-colour on the centre of the breast. Under tail-coverts deep chestnut. Entire upper parts and wings dark green. Primaries black, tinged with green on the outer webs, and edged with rufous, the first abruptly attenuated at tip. Tail dark green, with a dusky grey apical band. Bill bright yellow. Iris sienna-orange. Feet dark red.

Total length 10¼ inches, wing 5¾, tail 4, culmen ¾.

Female. Top of head greyish purple, sides of face in front deep rose, centre of throat and chin black. Upper parts and breast bronzy green, rest of underparts white. Under tail-coverts chestnut. Tail green, with a pale rufous apical band.

Young. Plumage almost uniformly green. Chin pale red. Middle of abdomen white. Under tail-coverts chestnut.

40. PTILOPUS WALLACEI.

Ptilonopus wallacei, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 136; id. List Mamm. & B. New Guin. p. 45 (1859); Wall. Ibis, 1865, p. 330.

Ptilopus wallacei, Schlegel, Mus. Pays-B. 1873, p. 18, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197.

Hab. Aru Islands (*Wallace*); Kei Island (*Von Rosenberg*).

This beautiful bird, one of the most lovely species of this lovely group, was procured by Mr. Wallace on the Aru Islands, and described by Gray (*l. c.*). It is still very rare in collections; and for the examples from which my description was taken I am indebted to the Marquis Doria, who sent them to me from the Museum of Genoa. I have also examined the type in the British Museum.

Adult male. Top of head and occiput carmine. Chin, throat, and sides of head pure white. Nape, neck, and breast pure grey. A band of white across lower part of breast, succeeded by a broad one of deep orange. Abdomen and under tail-coverts light yellow, the latter striped with green. Upper part of back grey, bordered with orange; scapulars and lesser wing-coverts grey, margined with green. Shoulders orange. Secondaries bright green, margined with lemon-yellow. Quills deep green, the first one narrowed gradually

to the tip. Back and rump yellowish green. Tail coppery green, apical half of lateral feathers greenish white. Bill yellow. Feet red. Iris orange-red.

Total length 10 inches, wing 6, tail $3\frac{1}{2}$, culmen $\frac{3}{4}$.

41. PTILOPUS AURANTIIFRONS.

Ptilonopus aurantiifrons, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 137; id. List Mamm. & B. New Guin. (1859) p. 45; Wall. Ibis, 1865, p. 380.

Ptilopus aurantiicollis, Schleg. Mus. Pays-B. 1873, p. 18, *Columbæ*.

Ptilopus aurantiifrons, var. *novæ-guineæ*, Meyer, Sitz. Ak. Wiss. 1874, p. 508.

Ptilopus aurantiifrons, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 197.

Hab. Aru Islands, Mysol (*Wallace*); Salwatty (*Von Rosenberg*); Batanta (*Laglaize*); New Guinea (*Wallace, D'Albertis*); Jobie (*Meyer, Beccari*).

This is a very beautiful and very distinct species. Dr. Meyer (*l. c.*) has proposed to separate the bird from the mainland of New Guinea, procured at Passim, from that of Jobie, on account of some slight variation in the hues of the plumage, such as the deeper orange of the forehead and the orange tint of the back of the head and breast, with also metallic reflections of the top of the head. I do not deem these slight differences of sufficient importance to give New-Guinea specimens a distinct specific rank. Examples from Batanta before me seem to be intermediate between those of Jobie and Passim, with more orange tints than in individuals from Jobie, and less than in those of Passim.

Adult. Forehead deep orange, rest of top and sides of head yellowish green. Throat pure white. Neck all around and upper part of breast leaden grey. Underparts yellowish green. Mantle and scapulars with some of the lesser wing-coverts grey, margined with green, some of the feathers of the mantle margined with orange. Rest of wing-coverts and secondaries yellowish green, margined with lemon-yellow. Primaries dark green, the first narrowed gradually to the tip. Back and upper tail-coverts yellowish green. Tail bronzy green, with a subterminal interrupted grey band; this band does not extend entirely across the outer web of each rectrix. Under surface smoky grey, with a light-grey apical band. Bill yellow; base swollen, red. Feet red. Iris orange.

Total length $9\frac{1}{2}$ inches, wing $5\frac{1}{4}$, tail $2\frac{3}{4}$, culmen $\frac{3}{4}$.

42. PTILOPUS ORNATUS.

Ptilopus ornatus, Schleg. Nederl. Tijdsch. 1871, vol. iv. p. 52; id. Mus. Pays-B. 1873 p. 18, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, et (1877) vol. x. p. 158.

Hab. New Guinea, Mount Arfak (*Rosenberg, Laglaize*).

This species seems to be entirely confined to the mainland of New

Guinea. At all events I have not seen a specimen from any of the islands. To state that it was a beautiful bird would be only equivalent to saying that it belongs to the genus *Ptilopus*. It is still quite a rare species in collections.

Adult. Top and back of head, sides of face, and back of neck purplish red. Chin and throat pale grey. Upper part of breast dark ochre, becoming a clearer yellow on the lower part of throat. Underparts bright green; feathers of abdomen edged with yellow; centre of abdomen pale yellow. Under tail-coverts lemon-yellow, streaked with dark green. Upper parts bright green, darkest on the mantle. A band of dark purplish red upon the shoulders. Wing-coverts light grey, margined with green. Primaries black, tinged with dark green on outer webs, the first narrowed gradually to tip. Secondaries bright green, edged with lemon-yellow. Tail bright green, with a broad light yellow apical band. Bill yellow, dark brownish towards the base in the skin. Feet red. Iris lemon-yellow, bordered with orange.

Total length 9¾ inches, wing 6, tail 3¼, culmen ⅝.

43. PTILOPUS GESTROI. (Plate XXXIV.)

Ptilinopus gestroi, D'Alb. & Salvad. Ann. Mus. Civ. Gen. vol. vii. p. 834 (1875).

Ptilopus gestroi, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 197.

Hab. Yule Island (*D'Albertis*).

This very beautiful species is singularly intermediate between the *Pt. ornatus* and *Pt. perlatus*, possessing as it does the head and neck of the latter with the body and tail of the former. I have only seen one specimen, kindly sent to me by my friend Count Th. Salvadori, a male, collected by Signor D'Albertis in Yule Island. In size it is larger than *Pt. ornatus* and more like *Pt. perlatus*. It is the representative of its near allies in the district it inhabits. As yet Yule Island is the only locality in which it has been obtained.

Adult male. Top and sides of head and upper part of back of neck olive-yellow. Chin, throat, and a broad line going round the lower part of neck light lead-colour, nearly white on throat. Lower part of throat ochraceous yellow. Upper part of breast greenish ochre, changing in certain lights to purplish. Lower parts of breast, abdomen, and flanks bright green. Under tail-coverts yellowish white, striped with bright green. Upper parts bright green. Wings with a rich dark purple band near the shoulders; the coverts pale grey, margined with green. Secondaries green, edged with lemon-yellow. Primaries dark green, the first narrowed gradually at the tip. Tail bright green, with a broad pale yellow apical band edged with green. Bill olive-yellow. Iris yellow. Feet carmine. Total length 10 inches, wing 6, tail 3¼, culmen ⅝.

44. PTILOPUS PERLATUS.

Columba perlata, Temm. Pl. Col. 559, livr. 94; Knip & Prév. Pig. vol. ii. pl. xxi.

La Perlée, Less. Compl. Buff. tom. iii. Ois. p. 31 (1837).

Ptilonopus perlatus, Gray, Gen. B. vol. ii. p. 466 (1844); id. Proc. Zool. Soc. 1858, p. 185; id. Cat. Mamm. & B. New Guin. (1859) p. 47; Wall. Ibis, 1865, p. 380.

Megaloprepia perlata, Bon. Compt. Rend. (1854) tom. xxxix. p. 1097.

Sylphitreron perlatus, Bon. Consp. Gen. Av. vol. ii. p. 40.

Ptilopus perlatus, Schleg. Mus. Pays-B. 1873, p. 17, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, (1877) vol. x. p. 157.

Hab. Aru Islands (*Wallace*); New Guinea (*Bernstein*); Salwatty, Jobie (*Von Rosenberg*); Amberbaki (*Laglaize*); Dorey (*Raffray*).

Like the last, this is rather a large species. It was placed by Reichenbach in his genus *Megaloprepia*; but I cannot see that it possesses any characters to separate it generically from the members of the genus *Ptilopus*.

Male. Chin and upper part of throat pure white. Moustache, sides, lower part of throat, and a narrow band separating the neck from the mantle pale grey. Top and sides of head and back of neck greenish yellow. Breast and a line beneath the grey band on the neck rufous. Lower part of breast, abdomen, and flanks yellowish green. Crissum and under tail-coverts pale yellow; the latter striped with dark green. Upper parts and wings bright green, with the centre of scapulars and smaller wing-coverts rosy purple. First primary slightly narrowed at tip. Secondaries edged with light yellow. Tail dark green above, beneath dark smoke-grey, with an apical greyish-white band. Bill yellow; feet red; iris orange-yellow. Total length 9$\frac{3}{4}$ inches, wing 6$\frac{3}{4}$, tail 3$\frac{3}{4}$, culmen $\frac{3}{4}$. No difference in the sexes.

Immature. Top of head green; lores and cheeks greenish yellow. Throat greyish white. Sides and back of neck grey; breast dark ochre. Rest of plumage like the male. (Spec. ex Dorey, New Guinea, Voy. Astrolabe.)

45. PTILOPUS ZONURUS.

Ptilopus zonurus, Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876–77) p. 197.

Hab. Aru Islands (*Wallace, Von Rosenberg*).

Like *Pt. perlatus*, save that the tail has an apical greyish-white band above and below. Barely distinguishable from *Pt. perlatus*.

46. PTILOPUS IOGASTER.

Columba hyogastra, Temm. Pl. Col. pl. 252, livr. 43; Desm. Dict. Sc. Nat. tom. xl. pl. 344 (1826); Knip & Prév. Pig. vol. ii. pl. 54.

Columba iogastra, Wagl. Syst. Av. (1827) sp. 34, *Columbæ*.

L'Hyogastre, Less. Compl. Buff. tom. iii. Ois. p. 30 (1837).

Ptilinopus hypogaster, Swains. Class. B. vol. ii. p. 347 (1837).

Ptilonopus hyogaster, Gray, Gen. B. vol. ii. p. 466 (1844); Wall. Ibis 1865, p. 381.

Iotreron hyogaster, Bon. Consp. Gen. Av. vol. ii. p. 25. sp. 4 (1857).

Ionotreron ionogaster, Reich. Taub. p. 100, pl. 239. figs. 1332–33.

Ptilonopus (Iotreron) iogaster, Gray, Proc. Zool. Soc. 1860, p. 359.

Ptilopus iogaster, Schleg. Mus. Pays-B. 1873, p. 20, *Columbæ*.

Ptilopus ionogaster, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 196.

Hab. Tidore (*Bruijn*); Batchian, Gilolo (*Wallace*); Weda, Dodingo, Ternate, Morotai (*Bernstein*).

This is a well-marked species, its grey head and purple abdomen making it very conspicuous among the other species of the genus.

Adult. Head, except occiput, clear grey. General plumage of body, neck, and occiput bronzy green. Abdomen almost entirely covered by a spot of deep reddish purple. Crissum and under tail-coverts rich lemon-yellow. Wings green. Some of the scapulars and greater wing-coverts violet-grey, margined with green. Primaries emerald-green, first narrowing gradually. Secondaries yellowish green, edged with lemon-yellow. Tail bronzy green, with an interrupted subterminal grey bar, this not reaching the edge of the outer web of the rectrices. Beneath smoke-grey, apical band white. Bill bluish white, tip yellow; feet lilac-purple. Total length 9 inches, wing $5\frac{1}{4}$, tail 3, culmen $\frac{5}{8}$.

47. PTILOPUS PECTORALIS.

Columba pectoralis, Wagl. Isis, 1829, p. 759.

Columba virens, Less. Voy. Coq., descr. ♀; id. Trait. Ornith. (1831) p. 471.

Columba cyanovirens, Less. Voy. Coq. pl. 42. fig. 2, ♀.

Omeotreron pectoralis, Bon. Consp. Gen. Av. vol. ii. p. 27.

Ptilonopus roseipectus, Gray, Proc. Zool. Soc. 1861, p. 432; Reich. Tauben, p. 191; Wall. Ibis, 1865, p. 381.

Ptilonopus virens, Wall. Ibis, 1865, p. 382.

Ptilopus pectoralis, Schleg. Mus. Pays-B. 1873, p. 23, *Columbæ*; Meyer, Rowl. Ornith. Misc. pt. xiii. p. 114 (1878).

Ptilonopus pectoralis, Salvad. Ann. Mus. Civ. Genov. (1875) vol. vii. p. 785.

Hab. Rubi, Passim, Andai, New Guinea (*Meyer*); Mysol (*Hoedt*); Gagie, Guébeh, Waigiou (*Bernstein*); Mafoor, Sook (*Von Rosenberg*); Batanta (*Laglaize*); Amberbaki (*Raffray*).

Examples from Batanta are of larger size, but otherwise do not seem to differ from those procured in New Guinea and other localities. The species has a rather wide distribution among the Papuan Islands.

Male. Forehead and chin greenish grey. A small reddish-purple spot upon the breast. Middle of abdomen and under tail-coverts light yellow; the latter striped with dark green. Rest of plumage of body yellowish green. A few of the scapulars with grey tips. Primaries dark green on outer webs, and bronzy green at tips; first

equal for its entire length. Secondaries yellowish green, edged with pale yellow. Tail bright yellowish green, with a grey spot at tip of feathers on inner webs. Underneath smoky black, with apical grey band. Bill yellow, base red; feet red; iris orange. Total length 8¼ inches, wing 4¾, tail 2¾, culmen ⅝.

Female. Like the male, but without the spot on the breast.

48. PTILOPUS VIRIDIS.

Columba viridis, Linn. (nec Scop.) Syst. Nat. vol. i. p. 283. sp. 23 (1766); Gmel. Syst. Nat. (1788) p. 780. sp. 23; Shaw, Gen. Zool. vol. xi. pt. 1, p. 65 (1819); Knip & Prév. Pig. vol. ii. pl. xvii.

Tourterelle à gorge pourprée d'Amboine, Buff. Pl. Enl. no. 142.

Ptilinopus viridis, Steph. Shaw, Gen. Zool. vol. xiv. p. 299. sp. 5 (1826).

Ionotreron viridis, Reich. Taub. p. 99, pl. 237. figs. 1320–21.

Iotreron viridis, Bon. Iconogr. Pig. (1857) pl. 28, juv. ♀?; id. Consp. Gen. Av. vol. ii. p. 24. sp. 1.

Ptilonopus viridis, Gray, Gen. B. vol. ii. p. 467 (1844–49); id. List B. Brit. Mus. (1856) p. 6; id. List Mamm. & B. New Guin. (1859) p. 45; id. Proc. Zool. Soc. 1863, p. 34; Wall. Ibis, 1865, p. 381.

Ptilopus viridis, Schleg. Mus. Pays-B. 1873, p. 22, *Columbæ*; Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876) p. 195.

Hab. Bouru, Amboyna, Ceram, Goram (*Wallace*); Harouka, Monavolka (*Rosenberg*).

This is the oldest-described member of the genus *Ptilopus*, and the only one known to Linnæus. It is entirely an insular species, confined to the islands west of New Guinea, upon which land I have found no record of its ever having been procured. It is represented in the east (Bay of Geelvink) by the next species.

Male. Forehead and upper part of throat light grey. Lower part of neck, and upper part of breast very deep reddish purple. Rest of underparts yellowish green. Crissum and under tail-coverts light yellow; the latter with broad dark green stripes on the inner webs of the feathers. Upper parts, occiput, and back of neck bronzy green. A grey band near the shoulder, and tertials also grey, edged with green. Primaries dark green; first about equal in width for the entire length; secondaries bronzy green, margined with lemon-yellow. Tail bronzy green and tipped with yellow, lightest on the edges. Bill yellow, base red; orbits yellow; feet pink-red; iris with inner ring yellow, outer red. Total length 8 inches, wing 4¼, tail 3, culmen ½.

49. PTILOPUS GEELVINKIANUS.

Ptilopus viridis geelvinkianus, Schleg. Nederl. Tijdsch. vol. iv. (1871) p. 23; id. Mus. Pays-B. 1873, p. 23.

Ptilopus musschenbroeckii, Rowl. Ornith. Misc. pt. xiii. pl. 95, p. 114; Salvad. Ann. Mus. Civ. Gen. vol ix. (1876) p. 195.

Hab. Islands of Mafor and Meosnoum (*Von Rosenberg, Raffray*); Mysore (*Meyer*).

This bird, separated from the *Pt. viridis* by Schlegel, is apparently entitled to be considered a distinct species. With a large series of examples before me, mainly brought by M. Raffray, the difference of the colour on the breast is very perceptible, being very much brighter and purer than the deep purple of *Pt. viridis*. In other respects the two species closely resemble each other. The term *musschenbrœckii*, being only a MS. name of von Rosenberg's, without any description of the bird given, must become a synonym.

Adult. Forehead and chin dark grey; sides of face grey, washed with green. Breast and lower part of throat bright reddish purple, much lighter than the similar spot in *Pt. viridis*. General plumage yellowish green, slightly bronzed in certain lights. Centre of abdomen and under tail-coverts pale yellow; the latter striped with dark green. Across the wing, near the shoulders, a broad band of pale grey. Some of the innermost secondaries with a spot of light grey near their tips; first primary not narrowed. Tail yellowish green, each feather with a subterminal grey spot on the inner web. Bill yellow, base red. Iris red; feet red. Total length 8 inches, wing $4\frac{1}{2}$, tail 3, culmen $\frac{5}{8}$. Sexes alike.

50. PTILOPUS EUGENIÆ.

Iotreron eugeniæ, Gould, Proc. Zool. Soc. 1856, p. 137; Gray, List B. Brit. Mus. (1856) p. 6; Bon. Iconogr. Pig. (1857), text.

Ptilonopus eugeniæ, Gray, List B. Trop. Isl. (1859) p. 39; Wall. Ibis, 1865, p. 381; Sclat. Proc. Zool. Soc. 1869, p. 124.

Ptilopus eugeniæ, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 195.

Hab. Solomon Islands.

The type specimen, which I have examined, of this apparently distinct species, is in a mutilated condition, and wants entirely the tail. The species is very close to the two preceding, but differs in the white head. The type in the British Museum is unique.

Top of head, cheeks, and upper part of throat white. Centre of lower throat and breast rich deep crimson. Back of neck and upper parts yellowish green. Across the shoulders a band of grey, and the tertiaries tipped with the same. Secondaries bright green, edged on the outer webs with yellow. Under surface greyish greeen. Tail wanting. Bill apparently greenish at base, yellow at tip. Wing $4\frac{3}{4}$ inches, culmen $\frac{1}{2}$. (Type.)

51. PTILOPUS RIVOLII.

Columba rivoli, Knip & Prév. Pig. vol. ii. pl. 57; Des Murs, Iconogr. Ornith. pl. 4 (1845).

Iotreron rivolii, Bon. Consp. Av. vol. ii. p. 25 (1857).

Ionotreron rivolii, Reich. Taub. p. 100, Taf. 235. fig. 1306.

Ptilonopus rivoli, Wall. Ibis, 1865, p. 381.

Ptilonopus solomonensis, Gray, Ann. Mag. Nat. Hist. vol. v. (1870) p. 328.

Ptilopus rivolii, Sclat. Proc. Zool. Soc. 1877, p. 109.

Hab. Duke-of-York Island (*Brown*), Wanga, San Christoval (*Brenchley*).

The type of the *Ptilopus rivolii* was originally in the collection of the Prince d'Essling, which was purchased by Dr. Wilson, and now forms part of the Museum of the Academy of Natural Sciences at Philadelphia. In the catalogue of Prince d'Essling's collection made at the time of its sale, the specimen of *Pt. rivolii* is entered on page 30 as having "Inde" for the habitat. The exact locality of this handsome species was unknown until Mr. George Brown, C.M.Z.S., obtained it in Duke-of-York Island, lying off the north-east coast of New Guinea. I am inclined to believe that the *Pt. solomonensis*, Gray, is based on a young bird of this species.

Male. Forehead purplish red; breast crossed by a broad white band, a large rose-red spot on the abdomen; lower part of abdomen, crissum, and under tail-coverts bright yellow. Rest of plumage bright green, with some small round bluish-black spots on the scapulars. In its dimensions this species agrees with the following one.

Female. General plumage bright green.

52. PTILOPUS PRASINORRHOUS.

Ptilonopus prasinorrhous, Gray, Proc. Zool. Soc. 1858, p. 185; id. List B. & Mamm. New Guin. 1859, p. 46; Wall. Proc. Zool. Soc. 1863, p. 34, ex Bouru.

Ptilopus rivoli, Schleg. (nec Prév.) Nederl. Tijdsch. tom. iv. p. 21 (1873); id. Mus. Pays-B. 1873, p. 24, *Columbæ*; Salvad. Ann. Mus. Civ. Gen. vol. ix. 1876, p. 196, ex Bouru.

Ptilopus prasinorrhous, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 196, (1877) vol. x. p. 157.

Hab. Ké Islands, Khoor, Tegoor, Matabello, Monavolka, Pulo-Pandang, Goram, Salwatty (*Von Rosenberg*); Bouru, Waigiou (*Wallace*); Amboina, Mysol (*Hoedt*); Koffiao (*Beccari*); Batanta (*Bruijn*); Sorong (*D'Albertis*).

This species appears to be very variable in its coloration from different localities; and it is a question if examples might not be procured leading completely from the typical style of this bird into that of the *Pt. rivolii*. It is mainly distinguished from this last by having the vent and under tail-coverts green, slightly margined with *yellow*, instead of these parts being bright yellow as in *Pt. rivolii*. In the collection at Leyden are specimens from the same locality (island of Bouru), with the under tail-coverts green and yellow respectively, which would seem to show that this character is an indefinite and unsatisfactory one. I do not consider that the specific distinctness of this bird from the *Pt. rivolii* has as yet been established. A larger series than I have had at my command, from all the localities known, will be necessary before the question can be determined. If the two are distinct, it would be a curious fact that, in the case of such closely allied species, *Pt. rivolii* should be restricted to the Duke-of-York Island, while the present is scattered over a dozen islands and also found upon the mainland of New Guinea.

Resembling in its coloration *Pt. rivolii*, but differs chiefly in the vent and under tail-coverts being green, slightly margined with yellow; the reddish-purple patch of the abdomen sometimes reaches the white pectoral band. First primary slightly narrowed at tip. Bill yellow; feet red.

53. PTILOPUS STROPHIUM.

Ptilinopus strophium, Gould, Jard. Contr. Ornith. 1850, p. 102, pl. 105 (note).

Ptilonopus strophium, Gray, List B. Brit. Mus. (1856) p. 6 (partim); id. List Mamm. & B. New Guin. (1859) p. 46; Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 196.

Ionotreron rivoli, Reich. Taub. p. 100, pl. 236 *b*. fig. 3364.

Ptilopus miqueli, Schleg. Ned. Tijdsch. (1873) vol. iv. p. 22; id. Mus. Pays-B. 1873, p. 26, *Columbæ*; Rowl. Ornith. Misc. part xii. p. 60, pl. 88 (1878); Salvad. Ann. Mus. Civ. Gen. vol. ix. p. 196 (1876).

Ptilopus miqueli, Meyer, Sitzungs. d. k. Akad. d. Wiss. vol. lxx. p. 128 (1874).

Ptilinopus miqueli, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 786.

Hab. Duchâteau Isles (*MacGillivray*, type of *Pt. strophium*, Gould); Jobie, Meosnoum (*Von Rosenberg, Meyer*).

Mr. Gould's type of his *Pt. strophium* is in the British Museum, and is undoubtedly the same bird as was afterwards described as *Pt. miquelli* by Prof. Schlegel. The type is faded upon the forehead and is more of a rosy hue than purple-red; but it is plainly evident, I think, that the original colour has faded away. Another specimen in the Museum collection, without any locality, has the forehead purplish red. The name *miqueli* will have to give way to the older one of *strophium*.

Male. Front and top of head purplish red. A broad pure white band across the breast, beneath which is a stripe of bluish green. Centre of abdomen and under tail-coverts bright yellow. Entire rest of plumage bright yellowish green, with some small round bluish-black spots on the scapulars near the tips. Primaries greenish black, first narrowed to the tip. Tail same colour as the back. Bill greenish, tip yellowish; feet red; iris orange. Total length 10¾ inches, wing 4½, tail 2¾, culmen ¾. (Ex type.)

Female. Plumage almost entirely green.

54. PTILOPUS BELLUS.

Ptilonopus bellus, Sclat. Proc. Zool. Soc. 1873, p. 696, pl. 57; Salvad. Ann. Mus. Civ. Genov. (1875) vol. vii. p. 786.

Ptilopus bellus, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, and (1877) vol. x. p. 157.

Hab. Atam, New Guinea (*D'Albertis*); Mount Arfak (*Laglaize*); Amberbaki (*Raffray*).

This very fine and distinct species is one of the largest of the

section of the genus to which it belongs. Originally described by Mr. Sclater from specimens obtained by D'Albertis on Mount Arfak, it has since been found in other parts of the northern coast of New Guinea. Beside its much greater size, it can always be distinguished from *Pt. speciosus*, its nearest ally, by the rosy-red forehead and crown, together with the purplish-red spot on the abdomen.

Male. Front and crown deep rosy red. Occiput dark bluish green. Breast covered by a broad, halfmoon-shaped band, pure white on the lower parts and sides, lemon-yellow on the upper part. Abdomen has the middle portion covered by a purplish-red patch. Entire rest of plumage yellowish green, with small round bluish-black spots on the scapulars, and the feathers of the crissum and under tail-coverts edged with yellow. Primaries greenish black, first not narrowed. Tail yellowish green, with a pale apical band of the same colour. Bill yellow; feet dark red; iris yellow. Total length $9\frac{1}{4}$ inches, wings $5\frac{3}{4}$, tail $3\frac{3}{4}$, culmen $\frac{5}{8}$.

55. PTILOPUS SPECIOSUS.

Ptilopus speciosus, Schleg. Nederl. Tijdsch. vol. iv. (1871) p. 23; id. Mus. Pays-B. 1873, p. 27, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197.

Hab. Sook, Mafor (*Von Rosenberg, Raffray*); Misori (*Raffray*).

This very peculiarly-coloured and striking species is apparently confined to the islands in the great Bay of Geelvink, New Guinea. It was first described by Schlegel from specimens sent by Von Rosenberg, and is very rare in collections. Lately a large series has been received at the Paris Museum, obtained by M. Raffray in the localities given above. There does not appear to be any variation among individuals from the different habitats.

Male. General plumage yellowish green, darkest on the head and neck. A broad bright-yellow band bordered on the lower side with white crosses the breast. Abdomen beautiful lilac; lower part of abdomen and under tail-coverts bright lemon-yellow. A purple spot in front of the eyes. Primaries grey on their outer webs and tips; first not narrowed especially towards tip. Tail yellowish green. Bill black, tip yellow; feet dark red. Total length 7 inches, wing $4\frac{5}{8}$, tail $2\frac{5}{8}$, culmen $\frac{5}{8}$.

Female. Green, with the feathers of the abdomen margined yellow, and under tail-coverts yellow. Primaries have outer webs and tips grey.

56. PTILOPUS JOHANNIS.

Ptilopus johannis, Sclat. Proc. Zool. Soc. 1877, p. 556.

Hab. Wild and D'Entrecasteaux Islands, of the Admiralty group ('Challenger' Expedition).

This very distinct species was obtained by the 'Challenger' Expedition, and derives its name from Mr. John Murray, one of the naturalists. By the kindness of Mr. Sclater I have been enabled to examine the types. With its nearest relationship perhaps to

Pt. speciosus, it differs conspicuously from all the members of this particular section of the genus *Ptilopus* in having the band which crosses the breast all yellow—and in this respect differs from all the others, as it is the only one so marked, the others having this band white, or yellow and white. It is a very beautiful species.

Male. General plumage green, with small dark blue spots on the scapulars. A broad band across the chest, which, together with the lower part of abdomen, crissum, and under tail-coverts, is light yellow. Top of head and middle of abdomen lilac. Primaries leaden grey, with the tips light grey, nearly white. Bill black, feet dark red. Total length 7½ inches, wing 4⅝, tail 2½.

Female. Nearly uniform green; middle of belly and crissum yellow.

57. PTILOPUS LUTEOVIRENS.

Colombe jaune, Hombr. & Jacq. Voy. Pôle Sud, pl. 12. f. 2.

Columba luteovirens, Hombr. & Jacq. Ann. Sc. 2e sér. vol. xvi. (1841) p. 315.

Colombe de Felicie, Hombr. & Jacq. Voy. Pôle Sud, pl. 12. f. 1, juv.

Columba felicie, Hombr. & Jacq. Ann. Sc. 2e sér. vol. xv. (1841) p. 316, juv.

Columba flava, Gray, Gen. B. vol. ii. p. 470 (1844–49).

Calœnas luteovirens, Hartl. Wiegm. Arch. 1852, p. 134.

Ptinilopus! *luteovirens*, Jacq. & Puch. Voy. Pôle Sud, vol. iii. p. 112 (text) (1853).

Ptinilopus! *feliciæ*, Jacq. & Puch. Voy. Pôle Sud, (1853), text, juv.

Ptilonopus luteovirens, Gray, List B. Trop. Isl. (1859) p. 38.

Chrysœnas luteovirens, juv. *feliciæ*, Reich. Taub. Suppl. p. 203, Taf. nov. no. iii. fig. 32.

Chrysœnas luteovirens, Reich. Taub. p. 90, t. 245. fig. 5594, t. 263. figs. 1469–70.

Chrysœna luteovirens, Bon. Compt. Rend. (1854) tom. xxxix. p. 879; id. Consp. Av. vol. ii. p. 28; id. Iconogr. Pig. (1857) pl. 31; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 134, Taf. ii. fig. 4, juv.; Layard, Proc. Zool. Soc. 1875, p. 436; Finsch, Proc. Zool. Soc. 1875, p. 557; Finsch, Journ. Mus. Godeff. Heft xii. (1876) p. 10.

Omotreron feliciæ, Bon. Consp. Gen. Av. vol. ii. p. 27 (1857), juv.

Hab. Fiji Islands, Balaou (*Hombr. & Jacq.*, type); Ovalau (*Layard*); Viti Levou (*Godeffroy*).

This species, according to Layard, dwells in the forest-covered parts of the island of Ovalau and the Rewa. It breeds in October, November, and December. On account of the colour of their plumage it is difficult to see them in the trees; but their presence is betrayed by their voice, which sounds something like a bark. It feeds on berries, and is fond of the seeds of araliaceous trees and creepers of the genus *Melastoma*.

This species is the type of Bonaparte's genus *Chrysœna*, the chief

character being the lanceolate shape of the feathers of the body. This, however, would seem to indicate more a specific than a generic value, as the *Pt. victor*, with which the present bird is generically identical, does not possess this form of feather. As is shown in my remarks on genera, in the beginning of this paper, neither of these two species exhibits any characters that, in my opinion, would separate them from the genus *Ptilopus*, those relied upon by authors for establishing a distinct generic rank not being at all peculiar to, or possessed solely by, these birds.

Male. Head greenish yellow. Throat and irregular collar on lower part of neck lemon-yellow. Feathers of breast and back lanceolate sulphur-yellow, tinged with green. Abdomen, vent, and under tail-coverts bright yellow. Primaries dark greenish yellow, first not narrowed especially; secondaries pale green, both edged with lemon-yellow. Tail pale green, graduating into light yellow at the tip. Bill black, tip yellow. Feet black. Total length 8 inches, wing $4\frac{3}{4}$, tail $2\frac{1}{2}$, culmen $\frac{5}{8}$. (Ex type, Paris Museum.)

Young male. Head and throat pale green. General plumage bright green, with yellow lanceolate feathers appearing upon the breast and back. Abdomen mixed with yellow and green. Under tail-coverts saffron-yellow. Primaries and secondaries brownish green, broadly margined with yellow. Some feathers of the rump and upper tail-coverts tipped and margined with yellow. Tail bright green. Bill black, tip yellow. Feet black.

Female. General plumage bright green, verging to yellow on the throat and abdomen. Primaries and secondaries margined with light yellow. Under tail-coverts pale yellow. Tail bright green, lightest at the tip. Bill black, tip yellow. Feet black.

58. PTILOPUS CORRIEI.

Ptilinopus corriei, Ramsay, Proc. Linn. Soc. New South Wales, 1876, p. 133, vol. i.

Hab. Malacolo Island, New Hebrides.

In the above-named publication Mr. Ramsay describes a specimen of *Ptilopus* as representing a distinct species. It is evidently immature, and, judging from the description, belongs to the group comprising *Pt. victor*, *luteovirens*, and *layardi*; and it is not impossible that it may be one of these species from a new locality, although the dimensions given are larger than those of any examples of the above-named species that I have seen. The type had been in spirits, and, as stated by Mr. Ramsay, was somewhat discoloured on the sides of the neck and interscapular region. The texture of the feathers resembled that of *Chrysœnas viridis*, Layard (*Pt. layardi* of this paper). Only a single specimen was procured by Dr. A. Corrie, at Malacolo Island, during the cruise of H.M.S. 'Pearl,' in August 1875. More specimens will be required before its specific rank can be satisfactorily determined.

The following is Mr. Ramsay's description:—

Male. "The whole of head, chin, and throat olive-green, becoming bright green on the neck and occiput; the whole of the remainder

of the upper and under surface bright deep green; the wing-quills deep golden green, mesially shaded with black; the inner webs of the primaries black towards the middle and basal portion of the feather. The three inner secondaries and their corresponding coverts of the larger series only have an oblique oblong blotch of bright golden yellow at their tips, which on the secondaries is confined to the outer web only, the smaller wing-coverts at the bend of the wing adjacent to the scapulars having a roundish, crescentic or cordate spot of white (?) near the tips of the feathers; some show a green shaft-line and a margin of green round the tip of the feather; under wing-coverts green; the outer series ashy; under surface of the wings ashy brown; under surface of the tail ashy brown, becoming lighter towards the base, and crossed conspicuously near the tip with a band of light ashy grey; upper surface green, the grey band not so conspicuous; the inner portion of the legs and lower part of the abdomen yellowish (much faded); under tail-coverts yellow, blotched with oblong marks of green on inner webs; the thighs, outer feathered portion of the legs, and the flanks bright green, like the rest of the body; tail of 14 feathers, square, even; of the wings, the third, fourth, and fifth feathers are nearly equal and longest; bill, legs, and feet bluish lead-colour; tarsi not feathered to the toes, lower portion scaled in front. Total length 9·5 inches, wing 6·3, tail 3; bill from forehead 0·8, from gape 1; tarsus ·95."

59. PTILOPUS LAYARDI.

Chrysœnas viridis, Layard, Proc. Zool. Soc. 1875, pp. 151, 437; Finsch, Proc. Zool. Soc. 1877, p. 736.

Native name *Sokulu* (Layard).

Hab. Kandavu, Fiji Islands.

This apparently very distinct Pigeon was described by Layard (*l. c.*) from specimens obtained by himself at Kandavu. He at first identified it, as he tells us, with *P. luteovirens*, but afterwards, having obtained it in the full breeding-dress, saw that his first impression was an erroneous one, and then conferred upon the species the name of *viridis*. Several specimens of this pretty Dove are in the collection of the 'Challenger' Expedition, which, through the kindness of my friend Dr. Sclater, I have had the opportunity of examining. They are all in the adult dress, with greenish-yellow head, and entirely green body relieved only by the yellow of the under tail-coverts. The feathers of the back are slightly inclined to the lanceolate form of those of *P. luteovirens*; but the two species cannot well be confounded together. As I do not consider that the birds included in the term *Chrysœnas* possess any characters that should properly separate them generically from *Ptilopus*, it will be impossible to retain the name of *viridis* given to this species by Mr. Layard, as there is already, unfortunately, a species of this group so named, described originally by Linnæus. I have therefore substituted the name *layardi*, in justice to my friend, who has, in his researches among the birds of the Fiji Islands, exhibited the same energy and

love for natural history which has always characterized him in other parts of the world in which his lot has been temporarily cast.

Male. Head and neck greenish yellow; under tail-coverts bright yellow. Thighs and lower part of abdomen grey. Rest of plumage of body and wings dark green, with a golden gloss upon back and chest. Primaries are edged with yellow on outer webs, and, together with the secondaries, have nearly all the inner webs golden yellow; the first primary is narrowed gradually towards the tip. Bill blue-black, tip livid; legs dark crimson; iris yellowish. Length $7\frac{3}{4}$ inches, wing $4\frac{1}{3}$, tail $2\frac{1}{3}$, culmen $\frac{5}{8}$ (skin).

Female. Like the male, but less brilliant generally.

60. PTILOPUS VICTOR.

Chrysœna victor, Gould, Proc. Zool. Soc. 1871, p. 642; Layard, Proc. Zool. Soc. 1875, p. 437; Finsch, Proc. Zool. Soc. 1875, p. 557; Rowl. Ornith. Misc. pt. v. pl.; Finsch, Journ. Mus. Godeff. Heft xii. (1876) p. 10; Lay. Ibis, 1876, p. 151; Finsch, Proc. Zool. Soc. 1877, p. 736.

Native name *Buli ndamu* (Layard).

Hab. Fiji Islands, Bua (*Filhol*); Vanua Levu, Taviuni, Ngami, Lanthala (*Layard*).

Layard says that this Dove is the glory of the forest of Taviuni, and is also found in Lanthala and Rambi Islands, also on Vanua Levu, about Bua, Ndreketti, &c. The young males would be mistaken for females, but that the vent is more orange. They breed about December or November, making a rude platform of small twigs for a nest about ten feet from the ground, and lay two eggs, axis 1″ 4‴, diam. 1″, pure white in hue. The species feeds on many sorts of small and large berries and fruits.

Male. Head and throat dull olive-green. Entire rest of plumage bright orange-carmine. Under surface of wings bright yellow. Primaries greenish yellow, edged with orange; first not narrowed. Tail, which is very short and almost hidden by the upper-coverts, brownish orange, graduating into pure orange at the tip. Bill and feet black. Total length 7 inches, wing $4\frac{1}{4}$, tail $2\frac{1}{2}$, culmen $\frac{1}{2}$.

Female. Head yellowish green, lightest upon the throat. Entire plumage of body rich green; inner webs of primaries and secondaries broadly margined with orange; outer webs edged with the same colour. Under tail-coverts orange, with the centre of the feathers green. Bill black, tip yellow; feet black.

61. PTILOPUS LECLANCHERI.

Trerolæma leclancheri, Bon. Compt. Rend. (1855) tom. xli. p. 247; id. Iconog. Pig. (1857) pl. 16.

Carpophaga leclancheri, Gray, List B. Brit. Mus. (1856) p. 21. sp. 19.

Leucotreron gironieri, J. Verr. & Des Murs, Ibis, 1862, p. 342, pl. 12, ♀; Wald. Trans. Zool. Soc. vol. ix. p. 213 (1875).

Ptilopus geversi, Schleg. Ibis, 1863, p. 120.

Ptilopus hugonianus, Schleg. Nederl. Tijdsch. 1863, p. 60, pl. 3.

fig. 2, juv. ex Luevu; Wall. Ibis, 1865, p. 378; Schleg. Mus. Pays-B. 1873, p. 36.

Ptilopus leclancheri, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 199.

Hab. Philippines, Luzon, and Guimaras (*Meyer*).

This species was first described by Bonaparte (*l. c.*) as *Trerolæma leclancheri*. The type is a female, and resembles in a great degree the specimen described by Lord Walden (*l. c.*) from Guimaras, brought by Meyer, and called, in Lord Walden's memoir on Philippine birds, *Leucotreron gironieri*. The type was brought to Paris by M. Leclancher, who was attached as surgeon to the expedition of the 'Favourite;' but no locality whatever was given to the specimen; so that of New Guinea, furnished by Bonaparte (*l. c.*), is erroneous. Messrs. J. Verreaux and Des Murs redescribed the species in 'The Ibis' (*l. c.*) as *Leucotreron gironieri*, their specimen being also a female or possibly a young male, bearing, however, a very close resemblance to Bonaparte's type. Schlegel (*l. c.*) also described a young bird of the same species as *Ptilopus hugonianus*. All these names must become synonyms of that given by Bonaparte.

Male. Head, neck, and upper part of the breast ashy white, washed on the nape with pale green; chin and throat black. A broad dark purple band crosses the breast just below the white. Flanks and underparts ashy green. Under tail-coverts cinnamon. Upper parts bright green. Wings green; primaries and secondaries black on inner webs, dark green on the outer, all edged with yellowish white. Tail bright green, with a terminal light-yellow band. Bill yellowish; feet red. Total length 9½ inches, wing 6, tail 4, culmen ¾.

Female. Head and breast ashy white, nape pale green. Throat and chin black. A purplish band on the breast, which does not extend across. Rest of underparts and flanks tawny ashy green. Under tail-coverts chestnut. Upper parts and tail as in the male described above. (From type of *Tr. leclancheri*, Paris Museum.)

62. PTILOPUS OCCIPITALIS.

Ptilonopus occipitalis, Gray, Gen. B. vol. ii. p. 467, pl. 118 (1844); id. List B. Brit. Mus. *Gall.* p. 1 (1844), (1856) p. 7. no. 17; Wall. Ibis 1865, p. 378; Mart. Journ. für Ornith. 1866, p. 22. no. 124.

Ramphiculus occipitalis, Bon. Compt. Rend. tom. xxxix. p. 878 (1854); id. Iconogr. Pig. pl. 14 (1857); id. Consp. Av. vol. ii. p. 17; Wald. Trans. Zool. Soc. vol. ix. (1875) p. 214.

Omotreron batilda, Bon. Compt. Rend. tom. xxxix. p. 878 (1854); id. Consp. Av. vol. ii. p. 27; Wall. Ibis, 1865, p. 382; Von Mart. Journ. für Ornith. 1866, p. 22. no. 125 (juv.).

Ionotreron occipitalis, Reich. Taub. p. 101, pl. 239. fig. 1331.

Columba occipitalis, Schleg. Handl. vol. i. p. 411 (1857).

Lamprotreron porphyria, Bon. (nec Temm.), Iconogr. Pig. (1857) pl. xv. (juv.), from type of *O. batilda*.

Ptilopus occipitalis, Schleg. Mus. Pays-B. 1873, p. 35, *Columbæ*.

Hab. Luzon, Philippines (*Meyer*).

Bonaparte described a young bird of this species, in the 'Comptes Rendus' (*l. c.*), as *Omotreron batilda*; and afterwards, in his 'Iconographie des Pigeons,' he figured this specimen as the young of *Ptilopus porphyreus*! The type of *O. batilda* is in the collection of the Paris Museum, and proves to be simply a young bird of *P. occipitalis*. It is larger than any specimen of *porphyreus*, of which there is a series before me, even exceeding the adults in its measurements, and presents quite a different coloration. The type was brought from the Philippines in 1839 by M. Barrot, but no particular island is indicated.

Adult. Top and front of head light leaden grey; sides of face below the eyes and entire back of head purplish red. Throat yellowish white; sides of neck and breast grey, like the top of head. Entire centre of breast, from the lower part of the throat to the abdomen, ochraceous; flanks bright green; a large purplish-red spot in the middle of the abdomen. Crissum grey mingled with white. Upper parts bronzy green, darkest upon the rump and upper tail-coverts. Wings bright green; primaries and secondaries black on their inner webs, green on their outer and edged with light yellow. Tail bright green, with an apical greyish band; under coverts white, with a broad green stripe on their inner webs. Bill red, with light tip; feet red. Total length 11¾ inches, wing 6⅛, tail 4½, culmen ⅝. (Specimen figured by Bonaparte, Icon. Pig. pl. 14.)

Young. Top of head, back of neck, and entire upper parts bronzy green. Throat yellowish white. Sides of head yellowish white, interspersed with green. Underparts greyish green, bronze upon the breast. Crissum and under tail-coverts whitish, the latter striped with green. Wings like the back, the secondaries and primaries edged on outer web with yellowish white. Tail bright green, with a greyish-white apical band, which is observed only on the inner webs. Total length 11 inches, wing 6, tail 4, culmen ⅝. (Type of *batilda*, Bon.)

63. PTILOPUS GULARIS.

Columba gularis, Quoy & Gaim. Voy. Astrol. Zool. vol. i. p. 247, pl. xxix. (1830).

La Mentonnière, Less. Comp. Buff. tom. iii. Ois. (1837).

Columba gularis, Knip & Prév. Pig. pl. xi.

Laryngogramma gularis, Reich. Tauben, p. 102, pl. 233. fig. 1297; id. suppl. p. 203, nov. Taf. iv. fig. 44.

Leucotreron gularis, Bon. Consp. Av. vol. ii. p. 15 (1857); Wald. Trans. Zool. Soc. vol. viii. (1872) p. 83; Salvad. Ann. Mus. Civ. Gen. (1875) vol. ix. p. 670.

Ptilonopus gularis, Wall. Ibis, 1865, p. 377.

Ptilopus gularis, Schleg. Mus. Pays-B. (1873) p. 57, *Columbæ*.

Hab. Celebes.—Menado (*Wallace*); Tondano (*Forsten*); Gorontalo, Wawou, Bone, Modelido (*Von Rosenberg*).

Peculiarly a Celebes species, the present bird has fortunately never received another name beside the one originally bestowed on it by Quoy and Gaimard (*l. c.*). In its long tail it differs from the majority of the species of *Ptilopus*, and approaches the birds placed by Reichenbach in "*Megaloprepia*;" but the first primary is abruptly attenuated.

Adult. Top and sides of head grey, graduating into light green upon the occiput and hind neck. Chin and centre of throat very deep chestnut; rest of throat, neck on sides, and underparts lavender-colour, with a large spot in the centre of the abdomen yellowish white washed with rufous. Thighs and under tail-coverts rich dark cinnamon. Upper parts, wing, and tail bright green, the rectrices indistinctly tipped with yellowish green. Primaries and secondaries black on inner webs, green on outer, and edged with light yellow. Bill yellow; iris orange-brown; eyelids and orbits bare, blue; feet red. Total length 13¼ inches, wing 6⅝, tail 5⅞, culmen ¾. (Type in Paris Museum.)

64. PTILOPUS FISCHERI.

Ptilinopus fischeri, Brügg. Brem. Abhandl. (1876) p. 82, Taf. iv.

Hab. Celebes.

I only know this handsome species by the description and figure published by Dr. Brüggemann (*l. c.*). Is is apparently very distinct from all the known forms, and cannot be compared with any of them. The red patch on the side of the head is a very peculiar character.

It may be briefly described as follows:—

"Back green. Head, neck, and breast partly grey, partly golden ochre. Under tail-coverts grey and white intermixed. Sides of head in the male bluish red; back of neck with a black band. Total length 400 millims., wing 168, tail 147, bill 17, tarsus 21." (*Brügg. l. c.*)

65. PTILOPUS ALBOCINCTUS.

Ptilinopus albocinctus, Wall. Proc. Zool. Soc. 1863, p. 496, pl. xxxix.; id. Ibis, 1865, p. 377.

Ptilopus cinctus florensis, Schleg. Nederl. Tijdsch. vol. iv. p. 20 (1873).

Hab. Flores (*Wallace*).

This species, which seems distinct from *Pt. cinctus*, was first described by Wallace (*l. c.*). It differs from its ally in having the neck and breast light blue, and the first primary less attenuated. The bill, according to Wallace, is greenish at the base, yellow at tip; feet bright red. I have examined the type in the British Museum. In size and all other characters, save those pointed out, it is like *Pt. cinctus*.

66. PTILOPUS CINCTUS.

Columba cincta, Temm. Pig. & Gall. vol. i. p. 243 (1813); Knip & Prév. Pig. vol. ii. pl. xxiii.; Shaw, Gen. Zool. vol. xi. p. 50 (1819); Wagl. Syst. Av. (1827) sp. 19, *Columba*.

Leucotreron cincta, Bon. Compt. Rend. (1854) tom. xxxix. p. 876; id. Consp. Av. vol. ii. p. 15; Reich. Tauben, p. 103, pl. 238. fig. 1328.

Ptilonopus cinctus, Gray, Gen. B. vol. ii. p. 467 (1844); id. List B. Brit. Mus. (1844) p. 2, (1856) p. 8. sp. 22; Wall. Ibis, 1865, p. 377.

Ptilopus cinctus, Schleg. Nederl. Tijdsch. tom. iv. p. 19 (1873); id. Mus. Pays-B. 1873, p. 34.

Hab. Timor (*Wallace, Müller*); Wetter (*Hoedt*).

This bird is about the same size as the *Pt. gularis*, but has a long and square tail, the feathers of which are very broad. It belongs to the large members of this genus, and should, from its size, be included in the genus *Megaloprepia*, if that were really a valid division; but then it has an abruptly attenuated primary, which although not a generic character, as I have shown, still, according to Reichenbach, prevents its entrance into his genus (?).

Adult. Head, neck, throat, and entire breast white; rest of underparts yellowish green, separated from the white breast by a black band. Entire upper parts, wings, and tail black; the rectrices with a broad apical dark grey band. Under tail-coverts dark grey on the inner webs, white on the outer, margined broadly with bright yellow. Bill ochre-yellow, greenish at base; feet red; iris red. Sexes alike. Total length 12¼ inches, wing 6½, tail 5½, culmen ⅝.

67. PTILOPUS LETTIENSIS.

Ptilopus cinctus lettiensis, Schleg. Mus. Pays-B. 1873, p. 35, *Columbæ*; id. Nederl. Tijdsch. Dierk. tom. iv. p. 20 (1873).

Hab. Lettie, east of Timor (*Hoedt*).

This bird is apparently entitled to be considered distinct from the *Pt. cinctus*. I am indebted to my friend Count H. Turati for the loan of a very fine specimen, exhibiting very clearly the differences existing between it and *Pt. cinctus*. The principal one is the coloration of the tail, which for one third of its length from the tip is yellowish white, instead of having merely a dark grey apical band as in *Pt. cinctus*. Another difference between the birds is that the last-named species has the first primary abruptly attenuated, while that of the present is gradually narrowed to the tip, which is sharply pointed. The tails of both are long and square, as in *Pt. bernsteini*.

Adult. Head, mantle, throat, neck, and breast ivory white; beneath the white of the breast is a broad blue-black band. Lower part of abdomen and crissum greenish yellow. Under tail-coverts brownish in the centre; rest white, margined with yellow. Back and wings black; first primary gradually attenuated to the tip, which is pointed. Rump greenish grey. Tail greyish black for two thirds of its basal half, rest yellowish white. Bill green, tip ochre; feet dark red. Total length 11¾ inches, wing 6¼, tail 4⅝, culmen ⅝.

68. PTILOPUS BERNSTEINI.

Carpophaga formosa, Gray, Proc. Zool. Soc. 1860, p. 360 (nec *P. formosus*, Gray, ex Celebes).

Ptilopus bernsteini, Schleg. Nederl. Tijdsch. 1863, p. 59, pl. iii. fig. 1.

Ptilonopus ochrogaster, Bernst. Journ. für Ornith. 1864, p. 408.

Ptilopus ochrogaster, Bernst. Nederl. Tijdsch. 1865, p. 324.

Carpophaga bernsteini, Wall. Ibis, 1865, p. 388.

Megaloprepia bernsteini, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 788.

Hab. Halmahera, Ternate, Batchian, Obi (*Bernstein*); Gilolo (*Wallace*).

This and the next three species have been placed by some authors in Reichenbach's genus *Megaloprepia*. It seems very evident that at least some of the species which he placed in his genus were not known to Reichenbach autoptically, or else when desiring to separate certain members of the genus *Ptilopus* generically from the others he would probably not have selected *Pt. perlatus*, with its short tail and narrow rectrices, as one of those especially fitted to go with the present and the succeeding ones. I fail to see any characters whatever that should cause this bird and *Pt. magnificus*, with its two races, to be separated generically from *Ptilopus*. The gradation from *Pt. leclancheri*, through *Pt. gularis*, *cinctus*, *albocinctus*, *bernsteini*, *puellus*, and *assimilis*, is complete between the moderate-sized, comparatively short-tailed species of *Ptilopus* and the large *Pt. magnificus*, which brings the genus into *Carpophaga*. In his diagnosis of *Megaloprepia*, Reichenbach gives no character that may not equally apply to *Ptilopus*; and it seems to me to be a division highly artificial, and in no way necessary.

This species was first described by Gray (*l. c.*); but as he had already bestowed the name *formosus* upon another species of *Ptilopus*, his appellation cannot stand; and even for those authors who place this bird in *Megaloprepia*, to avoid confusion, it is better to continue the name bestowed by Schlegel.

Male. Head and neck greenish grey; breast, back, wings, and tail bright green. In the middle of the lower part of the breast a large spot of rich deep red. Abdomen and flanks yellowish ochre; under tail-coverts brownish yellow-ochre. Bill black, tip yellowish; feet black. Total length 11¼ inches, wing 5¾, tail 5½, culmen ⅝.

Female. Like the male, but wants the red spot on the breast, and has the neck light green.

It may be seriously questioned if the three following races should be continued as distinct species. They only differ in size; and this is very variable even among those examples acknowledged as representing *one* of the *species*. The localities of the forms also seem to have no recognizable bounds; and while the island form *puella* is the smallest, yet at Cape York it meets its large relative *magnificus*, which here, according to Mr. Ramsay, is *very variable in size*, and which, if the bird is distinct, ought not to be found at all in this part of the continent, which should be reserved for *assimilis*. I have no doubt that in a large series of examples from various localities the small *puella* would graduate directly up to *magnificus*,

and leave no characters by which the forms could be distinguished apart. The specimens of the smallest race, called *Pt. puella*, which are found in the island of Jobie and also at Mount Epa in the south of New Guinea, have the under surface of the tail lighter in colour than those from other localities, being blackish-grey instead of blackish-brown. This, however, cannot be considered of any specific importance, the geographical distribution alone forbidding the idea that they could be designated as a fourth race; for the *Pt. puella* is known to dwell between the Jobie and Mount-Epa birds as well as to the south of the latter, which fact is alone sufficient to preclude the supposition that two species, or even races, are indicated by the slight difference observable. For convenience I have kept the synonymy of the three races distinct; but they really should only be regarded as representing but one species.

69. PTILOPUS PUELLA.

Colomba amarante, Less. Voy. Coq. (text), 1826, p. 711.

Colomba puella, Less. Bull. Sc. Nat. (1827) p. 400; id. Trait. Ornith. (1831) p. 469; Knip & Prév. Pig. vol. ii. pl. i.

Carpophaga puella, Gray, List B. Brit. Mus. (1856) p. 21. sp. 18; Wall. Ibis, 1865, p. 388.

Megaloprepia puella, Bon. Consp. Gen. Av. vol. ii. p. 40; Reich. Taub. p. 102; id. Suppl. p. 203, nov. Taf. iv. fig. 41; Ramsay, Proc. Zool. Soc. 1876, p. 118.

Ptilopus puellus, Schleg. Mus. P.-Bas, 1873, p. 38, *Columbæ*.

Megaloprepia puella, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 788, vol. iv. p. 199, (1877) vol. x. p. 158.

Mapouha of the Papuans (*Less.*).

Hab. Cape York, Australia (*Ramsay*); Mysol, Salwatty, Waigiou, Ghémien, New Guinea (*Bernstein, Hoedt*); Jobie (*Von Rosenberg*); Dorey (*Lesson*); New Ireland (*Lesson*).

The type of this species is in the Paris Museum. There are two specimens, one from Dorey, New Guinea, and the other from New Ireland, both of which were procured during the voyage of the 'Coquille.'

Adult. Front and chin greyish white; head and neck greenish grey; centre of throat and neck in front, and underparts to the thighs, rich purplish red; lower part of abdomen and crissum rich yellow. Under tail-coverts greenish grey. Wings, back, and tail bright grass-green. Upon the outer web of the wing-coverts are some pale yellow spots forming a line along the wing. Bill yellow, red at base; iris orange-red; feet yellow-green; claws dusky. Total length 13⅜ inches, wing 6, tail 6¾, culmen ¾. Sexes alike.

70. PTILOPUS ASSIMILIS.

Carpophaga assimilis, Gould, Proc. Zool. Soc. 1850, p. 201.

Megaloprepia assimilis, Bon. Compt. Rend. tom. xxxix. p. 1077; Reich. Taub. p. 102; id. Suppl. p. 203, nov. Taf. iv. figs. 42, 43;

Ramsay, Proc. Zool. Soc. 1876, p. 115; Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 199.

Ptilopus assimilis, Schleg. Mus. Pays-B. 1873, p. 38, *Columbæ*.

Hab. Cape York, Rockingham Bay, Australia (*Ramsay*).

This is a race of *Pt. magnificus*, representing it in the northern part of Australia, and differing mainly in being smaller in size. Whether this is sufficient to constitute a species, I do not propose at present to discuss, but merely to remark that, as in many groups of birds it has been very properly rejected as a specific character, it would seem that, in the present instance, this bird and *Pt. magnificus* might with advantage be retained under one specific name.

Pt. assimilis was procured by Mr. Ramsay, together with *Pt. magnificus* itself, at Rockingham Bay, North-east Queensland. Except in its smaller size, he found that it presented no differences whatever from *Pt. magnificus*. He regards it as a connecting link between the large form and the smallest (*Pt. puella*), of which form he had received a fine pair collected at Cape York, Australia, by Mr. J. A. Thorpe, this being the first instance known to me in which *Pt. puella* has been obtained in Australia.

Head and throat grey; centre of throat and underparts to middle of abdomen rich purple. Under wing-coverts, thighs, and under tail-coverts rich yellow. Back and rump yellowish green. Wing and tail bright grass-green; wing-coverts with a conspicuous oblong spot at the tip. Total length 14 inches, wing 7, tail 6, culmen 3.

The specimen described was obtained at Cape York by the 'Challenger' Expedition.

71. PTILOPUS MAGNIFICUS.

Columba magnifica, Temm. Pl. Col. 163; id. Trans. Linn. Soc. vol. xiii. p. 125 (1822); Wagl. Syst. Av. sp. 26 (1827), *Columba*; Knip & Prév. Pig. vol. ii. pl. 25; Gould, B. Austr. vol. v. pl. lviii. (1848); Ramsay, Proc. Zool. Soc. 1876, p. 115.

Carpophaga magnifica, Selby, Nat. Libr. Ornith. vol. v. p. 119.

Megaloprepia magnifica, Reich. Tauben, p. 101, pl. 283. figs. 1299, 1300.

Ptilopus magnificus, Schleg. Mus. Pays-B. 1873, p. 38, *Columbæ*.

Hab. South Australia, river Hunter to Moreton Bay (*Gould*); Rockingham Bay, North-east Queensland (*Ramsay*).

Mr. Ramsay states in this journal (*l. c.*) that he found this species abundant at Rockingham Bay in North-east Queensland, and *very variable in size*.

Adult. Forehead and chin light grey; head and neck greenish grey, becoming light green on sides of breast; centre of throat and neck in front, breast, and abdomen deep purple. Lower part of abdomen orange-yellow. Under tail-coverts yellowish green. Wings, back, and tail bright green; wing-coverts with large pale yellow spots, forming a bar across the wing. Bill red at base, tip yellow. Total length 19 inches, wing 9, tail 7, culmen $\frac{7}{8}$.

May 21, 1878.

F. D. Godman, Esq., F.Z.S., in the Chair.

The following papers were read :—

1. Description of a new Genus of Snakes of the Family *Calamaridæ*, from Southern India. By Lieutenant-Colonel R. H. Beddome, C.M.Z.S.

[Received April 29, 1878.]

Xylophis, n. gen.

Body cylindrical, slender; head short, not distinct from neck, gradually narrowed forwards and pointed; eye very small, with round pupil; tail about one seventh of the total length; maxillary teeth very numerous, equal; the two palatine rows very conspicuous, and the teeth slightly longer behind; upper labials four, the first very minute, the second and third enter the orbit, fourth in contact with a large temporal; rostral very small; an elongate loreal gradually narrowed behind replaces anteocular and occupies all the space from rostral to eye; nasals simple, very small; frontals only one pair, large, a very small superciliary shield and a similar postocular. Scales smooth, without apical groove, in fifteen rows; anal single; subcaudals broad, bifid, or a few occasionally entire.

Xylophis indicus, n. sp.

General colour of a uniform brown like an earthworm, but beautifully iridescent; length $9\frac{1}{2}$ inches, of which the tail is $1\frac{3}{8}$ inch: vertical, pointed behind, rounded in front; occipitals elongate; ventrals about 136; subcaudals about 26, bifid, or a few of them entire; tail ending in a blunt point.

Hab. The dense heavy evergreen forests on the mountains at the south of Cumbum Valley, Madura district; elevation 5000 feet. Under old logs along with Uropeltidæ.

The specimen, which is unique, has been forwarded to the British Museum.

2. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. X. On the Birds of the Atlantic Islands and Kerguelen's Land, and on the Miscellaneous Collections. By P. L. Sclater, M.A., F.R.S.

[Received May 2, 1878.]

In this paper, which concludes the preliminary reports on the terrestrial birds collected during the voyage of the 'Challenger,' I

give an account of the specimens obtained on the Tristan-d'Acunha group and Kerguelen's Land, and of a few small collections made at various other localities which were touched at during the course of the expedition. I have arranged all these, according to the dates at which the places were visited, as follows:—

	Date.	No. of specimens.
A. St. Iago, Cape-Verds	July 1873	4
B. Tristan d'Acunha	October 1873	12
C. Kerguelen Land	January 1874	16
D. New Zealand	June 1874	4
E. Hong-Kong	December 1874	7
F. Meangis Islands	February 1875	3
G. At sea	February 22, 1875	2
H. Humboldt Bay, New Guinea ..	February 24, 1875	2
I. At sea	April 7, 1875	5
J. Japan	May 1875	4
		59

A. *St. Iago, Cape-Verds* (July 1873).

Four examples of the peculiar King-hunter of this Island, *Halcyon erythrogastra* (Temm.), Sharpe's Kingf. p. 171, pl. 63, were obtained here. In one specimen the eyes are marked "black," and the contents of the stomach "insects."

B. *Tristan-d'Acunha group* (October 1873).

Seven examples of the peculiar Thrush of Tristan d'Acunha, described by Mr. Gould, P. Z. S. 1855, p. 165, as *Nesocichla eremita*, were obtained. The sexes are not marked; but the specimens are all nearly alike, so that probably the sexes do not differ in plumage. The irides are noted as "black."

In the adjoining island "Inaccessible," five specimens of the peculiar Finch lately described by Dr. Cabanis (Journ. f. Orn. 1873, p. 154) as *Nesospiza acunhæ* were obtained. All five are alike; the eyes are marked "hazel;" but the sexes are not recorded.

Of *Crithagra insularis*, described by Dr. Cabanis at the same time as the *Nesospiza*, there is no specimen in the collection, nor of the Island-Hen (*Gallinula nesiotis*, Sclater, P. Z. S. 1861, p. 261). The latter is said to be now almost extinct[1].

The only oceanic birds in the collection from the Tristan-d'Acunha group are two Petrels, *Pelagodroma marina* and *Œstrelata mollis*, both from Nightingale Island, the most southern of the three islands of the group, and one Penguin (*Eudyptes chrysocome*) from Inaccessible; but Sir Wyville Thomson (Atl. ii. pp. 164, 178) mentions several others.

C. *Kerguelen Land* (January 1874).

The only land-birds from Kerguelen Land in the collection are

[1] Wyville-Thomson, 'Atlantic,' ii. p. 165.

nine specimens of *Chionis minor* and seven of *Querquedula eatoni*; and these are the only land-birds included by Mr. Sharpe in his memoir in the Royal Society's volume on the Transit-Expedition of 1875.

The female of the *Querquedula* (of which there is one example determined as such, and two others, evidently of the same sex) differs from the male not only in the absence of the green alar speculum, but also in its smaller size, in the fuscous edgings to the feathers generally, and in the much shorter tail. There is also one chick of this species in the collection.

D. *New Zealand* (June 1874).

In New Zealand only four skins, belonging to three species, were obtained, namely:—

1 *Miro albifrons* jr., Hardy Bay.
2 *Hæmatopus unicolor* jr., Hardy Bay.
1 *Botaurus pœciloptilus* jr., Wellington.

E. *Hong-Kong, China* (January 1875).

From Hong-Kong seven skins, belonging to four species, all known Chinese birds, were procured, viz:—

1 *Turdus mandarinus*, Bp.
1 *Halcyon pileata* (Bodd.).
2 *Alcedo bengalensis*, Gm.
2 *Coturnix communis*, Bonn.
1 *Turnix maculosus* (Temm.).

F. *Meangis Islands* (February 1875).

Four examples of *Eos indica* were obtained here (of which three have arrived home), under the circumstances mentioned in Mr. Murray's MS., as follows[1]:—

"On the 10th February, 1875, while the ship was dredging, some natives came off in a boat. They had with them mats and cocoa-nuts and some Perroquets. The following are those which were purchased for tobacco:—

"440, ♀.
441, ♀.
442, ♀.
443, ♂.
} Feet black; bill orange; eyes red, or light brown in the male.

"We kept the male for several days alive; he used to fly about the ship and return to the house on deck when shown his food.

"He died from eating some green stuff, it is supposed, but was perhaps hurt aloft.

"The natives came from the southermost isle of the Meangis group."

This is the most northern species of *Eos* known; its hitherto only ascertained locality is the neighbouring Sanghir group of islands[2].

[1] *Cf.* also Lord G. Campbell's 'Log-letters' p. 245.

[2] *Cf.* Rowley's Orn. Misc. p. 123, where a beautiful figure of this species is given.

G. *At sea* (February 22, 1875).

Two examples of *Phalaropus hyperboreus* in winter plumage (nos. 445, 446, both "females") were "shot by Mr. Moseley on February 22, 1875, among the drift wood." Mr. Murray "saw many the previous day."

This Phalarope is said to wander occasionally even as far south as the Aru Islands[1]. The present examples were obtained the day before the ship arrived at Humboldt Bay, New Guinea.

H. *Humboldt Bay, New Guinea* (February 23, 1875).

At this most interesting locality but two birds, unfortunately, were obtained, namely:—

447. *Trichoglossus cyanogrammus*, Wagl.
448. *Arses insularis*, Meyer.

The first of these is a well-known Papuan species. Of the second (shot by Mr. Murray under the circumstances mentioned in Lord George Campbell's 'Log-letters,' p. 253) the only specimens yet known were obtained by Dr. A. B. Meyer on the island of Jobi[2]. Its occurrence on the mainland is therefore of much interest.

Mr. Murray notes of this specimen, "Male; eyes brown; ring round the eye large and of a delicate sky-blue; bill and legs of a darker blue or violet.

"I landed in Humboldt Bay from the pinnace in a native canoe; and with some of the natives went a short way into the woods. Was not much over half an hour on shore. It was then that I shot the above two birds. I saw a Tern and a small Swift, also some Cockatoos, but all out of shot. I fired at another small bird, but did not get it. I also saw three Goura Pigeons, very fine large ones, and after a time got a shot at one, but did not bring it down. I should have had several more birds, but had to return to the boat on the signal."—J. M.

I. *At sea* (April 7, 1875).

Four days before arriving at Yokohama, and nearly due south of that port, five specimens of *Hirundo gutturalis*, the eastern form of our familiar *H. rustica*, were "caught round the ship. They were apparently in an exhausted state."

J. *Japan* (May 1875).

In Japan four specimens of birds were obtained—an example of *Buteo japonicus*, Bp., in Jedo Bay, and a hen *Phasianus versicolor* and two specimens of *Terekia cinerea* from the Inland Sea.

[1] *Cf.* Dresser, B. Europe.
[2] *Monarcha insularis*, Meyer, Sitz. Ak. Wien, lxix. p. 395.

3. On new and little-known *Mantidæ*.

By J. Wood-Mason.

[Received May 7, 1878.]

(Plates XXXV. & XXXVI.)

Genus Deiphobe, Stål.

M. Stål has recently[1] made the *Fischeria ocellata*, Sauss. (the nearest ally of *F. laticeps*), the type of a new genus, *Deiphobe*, and restricted, rightly as it seems to me, the name *Fischeria* to *Fischeria bætica* and its allies, species in which, as in *Eremiophila*, structures ancillary to the ovipositor[2] are developed upon the two terminal ventral segments of the abdomen. Though *F. laticeps* differs from *Deiphobe ocellata* in the form of the eyes (which are compressed and produced straight outwards in the form of blunt cones), in its long, stout, and subfoliaceous cerci (which extend far beyond the extremity of the abdomen), and in its more elongated and slenderer body, it yet resembles that species so closely in all other characters that its separation seems unwarrantable.

Deiphobe laticeps. (Plate XXXV. ♂ ♀.)

Fischeria laticeps, Wood-Mason, Ann. & Mag. Nat. Hist. 1876, 4th ser. vol. xviii. p. 337, ♂; *op. cit.* 1878, 5th ser. vol. i. p. 144, ♀.

Hab. ♀ ♀, Bangalore district, Mysore; ♂, Sheargaon, Kolapur State, India.

The typical specimens are in the Indian Museum, Calcutta.

Hierodula (Rhombodera) tectiformis.

Rh. tectiformis, Saussure, Mél. Orthopt. tom. i. fasc. 3, p. 216, pl. v. fig. 19, ♀.

In all the numerous specimens of this species which I have examined the basal or superior angle of the facial shield is produced into a small projecting spiniform tubercle—a point of structure not mentioned by M. de Saussure in his description.

The first branch of the discoidal vein of the tegmina terminates at the sutural margin in males in two, in females in three branchlets.

Hab. I have a ♂ from Jalra-patan, captured by Mr. Cecil Templeton of the Indian Topographical Survey, a ♀ from Sahibganj by myself, and a ♂ from Doomarkoonda in the same district, and a ♀ nymph from Sambalpur by Mr. Valentine Ball.

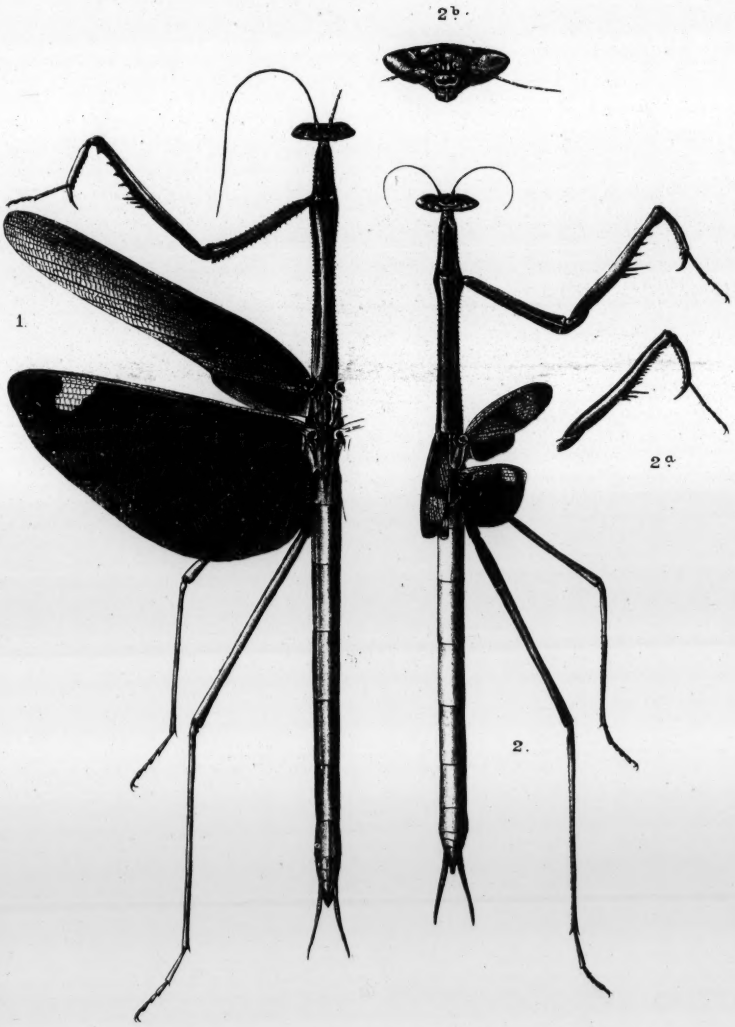
Obs. The lamellar fore margin of the tegmina is entire.

Hierodula (Rhombodera) butleri, n. sp. (Plate XXXVI. figs. 3, 3 *a*, 3 *b*.)

♂ ♀. Very closely allied to *H.* (*R.*) *tectiformis*, Sauss., from which it differs in having no projecting spiniform tubercle in the middle of

[1] Bihang till k. Svenska Vet. Akad. Hand. 1877, Bandet iv. No. 10.

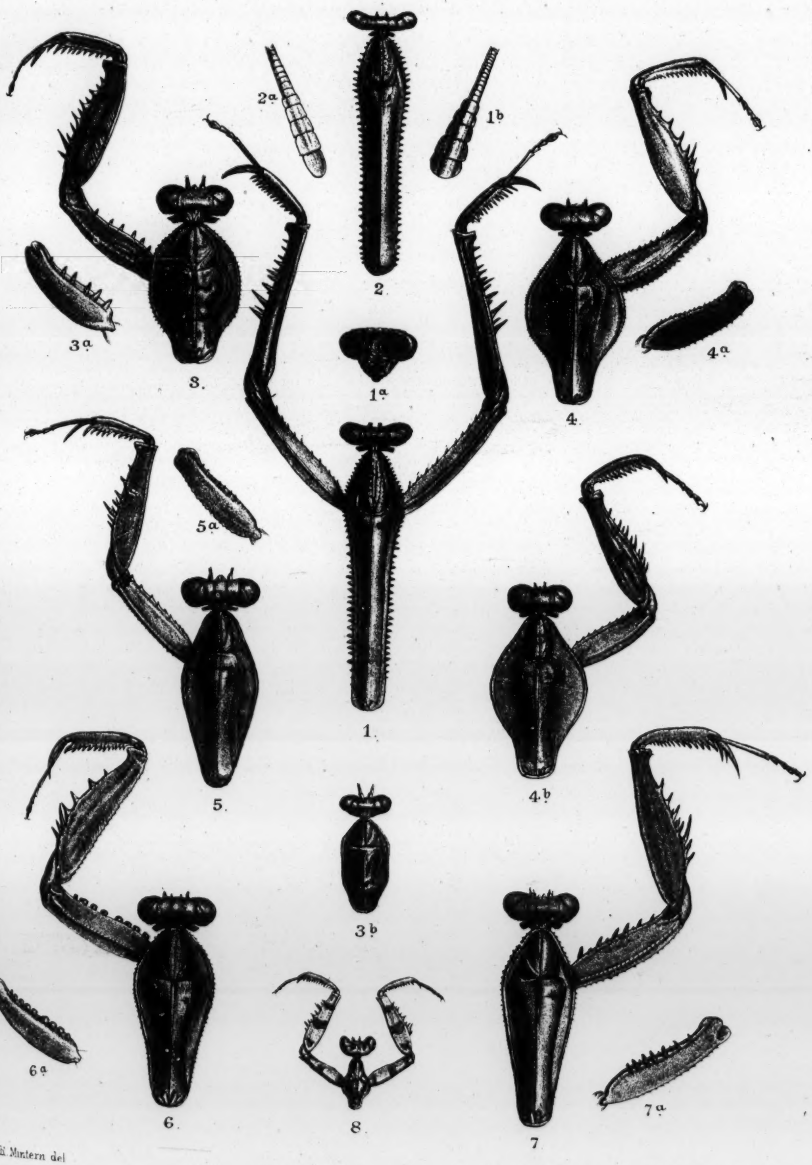
[2] I have observed similar structures in the South-African *Chroicoptera vidua*, Stål. All the insects thus provided probably lay their eggs in the earth.



Behari Lál Dós del.

Mintern Bros imp.

NEW MANTIDÆ.



H. Mintern del

NEW MANTIDÆ.

Mintern Bros imp

the superior margin of the facial shield, in having the lamellar expansions of the pronotum arcuate in outline, and consequently broader postero-laterally, and not angulate antero-laterally—in its more pointed tegmina, the first branch of the discoidal vein of which terminates at the sutural margin in three (♂) or four (♀) branchlets, instead of two and three respectively; the last branch of the median vein is undivided; and the stigma is bounded at either end by a dark blotch, is larger, and commences as much before the origin of the third branch of the discoidal vein as it does after it in the allied species,—in the armature of the fore coxæ, the anterior crest of which is furnished with five blunt and slightly curved conspicuous conical spines, arranged 3+2, and all arising from its inner side and not from its summit, the outer crest of which is only smoothly and obscurely denticulate—and in the coloration of the fore femora, which are transversely trifasciate externally, and have no conspicuous red blotch at the base of the inner face.

The fore tibiæ have thirteen teeth (♂ ♀) on the inner, and ten (eleven on one side in one ♀) on the outer edge.

The pronotum of the male is faintly constricted behind the setting-on of the fore legs; so that when viewed from above its lamellar margins appear slightly excised.

Total length, ♀ 72–82 millims.; length of pronotum, ♀ 20·5–22·25, ♂ 15·25; greatest breadth of pronotum (at the anterior end of its posterior lobe), ♀ 11·75–13·75, ♂ 7·75; breadth of primitive pronotum at dilatation, ♀ 8·5–10·75, ♂ 6; length of tegmina, ♀ 62–69, to stigma ♀ 19–22; breadth of tegmina, ♀ 22, of marginal field, ♀ 5·5; length of stigma, ♀ 5–6, ♂ 4·7; breadth of stigma, ♀ 1·3, ♂ 0·9.

Hab. The neighbourhood of Samaguting, Naga Hills, Assam, whence a specimen of the female was sent to me some years ago by my late friend Captain John Butler, the Political Agent, after whom I name it. A second and smaller specimen of the same sex has recently been obtained by Mr. A. W. Chennell, of the Indian Topographical Survey, in the valley of the Um-thana, W. Khasi Hills, at about 15,000 feet elevation. But the only male I have ever seen is a much mutilated and abnormally small insect from Sikkim in the collection of Mr. F. Moore.

Obs. The species differs in the form of the pronotum from *H. tectiformis* much in the same way as *H. deflexa*, Sauss., does from *H. laticollis*, Burm., Sauss.

The lamellar front margin of the tegmina is entire.

HIERODULA (RHOMBODERA) FRATRICIDA, n. sp. (Plate XXXVI. figs. 5, 5 *a*.)

♂. Allied to *H.* (*R.*) *macropsis*, Giebel, which it closely resembles in the form of the pronotum, but from which it differs in its larger size, in having the primitive pronotum apparently longer and stouter, the facial shield higher than broad and distinctly bicarinate, and in having the anterior crest of the fore coxæ rather lower and blunter (than usual) than produced and lamellar.

The organs of flight are long and rather pointed, extending, when closed, far (nearly a fourth of their length) beyond the extremity of the abdomen. The tegmina are hyaline everywhere except in the marginal field and along a very narrow linear space next to the principal nervure, between the base of the organ and the stigma, in which parts they are opaque green; the median vein gives off two branches; and the first branch of the discoidal is forked; the stigma is placed just after the origin of the third branch of the discoidal vein. The wings are throughout hyaline, save the marginal area, which is a little clouded with green; the discoidal vein is three-branched.

The front crest of the fore coxæ armed with ten to eleven low blunt tubercles, which become successively higher and sharper towards the distal end of the joint; and the external crest is quite smooth; the tibiæ have ten to eleven teeth on the outer edge, and 14 on the inner; the superior margin of the femora is slightly arcuate. The edges of lamellar margins of pronotum quite smooth.

Total length 85 millims.; length of pronotum 28, greatest breadth of pronotum 13·25; breadth of primitive pronotum at dilatation 8; length of abdomen 31+6 (last ventral segment)=37; length of tegmina 76, to stigma 20; width of tegmina 19, of their marginal field 5·25; length of stigma 4, breadth of stigma 0·9; length of antennæ 50.

Hab. The records of the British Museum state that the specimen was received in a collection of insects from Malabar.

Obs. The lamellar front margin of tegmina entire.

HIERODULA (RHOMBODERA) ATRICOXIS, n. sp. (Plate XXXVI. figs. 4, 4 *a*, 4 *b*.)

♂ ♀. Very closely allied to *H.* (*R.*) *laticollis*, Burm., from which it differs in having the lamellar expansions of the pronotum absolutely narrower, concave instead of straight postero-laterally, and not extended quite so far towards the base of the segment, and in having *the whole inner surface of the fore coxæ coloured jet-black*, and the hinder end of the prosternum and the mesosternum symmetrically marked with the same colour.

The anterior crest of the fore coxæ armed with minute blunt denticles and granules; tibiæ with eleven teeth (♂ ♀) on the outer edge, and ♀ 15, ♂ 14 on the inner.

Sexual differences the same as in the allied species.

Total length, ♀ about 80 millims.; length of pronotum, ♀ 27, ♂ 25·5, of which the anterior lobe is respectively, ♀ 8 and ♂ 7; greatest breadth of pronotum, ♀ 16, ♂ 15; breadth of primitive pronotum at supracoxal dilatation, ♀ 9·5, ♂ 9; length of tegmina, ♀ 50, ♂ 64, breadth of tegmina, ♀ 20, ♂ 19·5, breadth of marginal field, ♀ 6, ♂ 5; length of fore coxa, ♀ 18, ♂ 17; femur, ♀ 22, ♂ 20; of intermediate femur, ♀ 19, ♂ 18; tibia, ♀ 17, ♂ 15; of posterior femur, ♀ 22·5, ♂ 21·5; tibia, ♀ 23·5, ♂ 23.

Hab. ♀, Australia (*C. French*); ♂, one of the islands in Torres Straits (*MacFarlane*).

Obs. With the exception of the Indian *H.* (*R.*) *tectiformis*, which

has a great shining red blotch at the base of each of the femora, this is the only species of the genus which has any part of the internal face of the fore legs conspicuously coloured[1].

The lamellar fore margin of the tegmina is toothed[2] in both sexes, probably so as to act as a stridulating organ by scraping against the corresponding part of the wings.

HIERODULA (RHOMBODERA) PUSTULIFERA, n. sp. (Plate XXXVI. figs. 6, 6 *a*.)

♀. Allied to *H.* (*R.*) *major*, Sauss., but differing in its stouter and broader pronotum, which is more broadly rounded off in front, in the armature of the anterior crest of the fore coxæ, which is furnished with eight hemispheroidal yellow tubercles or callosities, all arising from its inner surface, gradually increasing in size from the proximal to the middle, and then gradually decreasing to the distal end of the joint, and constricted at the base so as closely to resemble the crushing-teeth of certain fossil fishes (*Pycnodus*).

The discoidal nervure of the wings emits four branches.

The fore tibiæ have eleven teeth on the outer edge and fifteen on the inner.

Total length 85 millims.; length of pronotum 29, greatest breadth of pronotum (just behind coxal groove) 12·5, of primitive pronotum at supracoxal dilatation 10, at middle of posterior lobe 6; length of tegmina 57, to stigma 21; breadth of tegmina 24, of marginal field 8; length of stigma 3, breadth of stigma 0·9.

Described from two alcoholic specimens.

A dried specimen in British Museum obtained at the same time measures total length 80 millims., and has the coxal callosities shrunken or less developed.

Hab. One of the islands in Torres Straits. The specimens were obtained by the Rev. M'Farlane.

Obs. The lamellar fore margin of the tegmina toothed.

HIERODULA (RHOMBODERA) TAPROBANÆ. (Plate XXXVI. figs. 7, 7 *a*.)

Hierodula taprobanæ, Wood-Mason, Ann. & Mag. Nat. Hist. 1878, 5th ser. vol. i. p. 146, ♀.

Hab. Ceylon.

Obs. The lamellar fore margin of the tegmina is smooth.

ARCHIMANTIS MONSTROSA, n. sp. (Plate XXXVI. figs. 1, 1 *a*, 1 *b*.)

Mantis monstrosus, Bates, MSS., in coll. Brit. Mus.

♀. Closely allied to *A. armata*, W.-M., ♀, differing in its greater size, in its proportionally longer tegmina (which are fully equal to the prothorax in length), in the form of the pronotum (which is dilated at the setting-on of the fore legs, so as to be conspicuously

[1] These coloured femora serve, in all probability, to allure or fascinate the prey.

[2] I first met with this curious structure of the tegmina in the *Empusidæ*, in all of which it occurs in both sexes alike.

ovate-cordiform in front), and in the form of the cerci, the margins of the foliaceous terminal joints of which are arcuate.

Fore tibiæ with sixteen or seventeen teeth on the inner and ten on the outer edge.

Total length 115 millims.; prothorax 41, of which the neck is 10; width of prothorax at supracoxal dilatation 10; height of head 8, breadth of head 11·75; length of meso- and metanotum taken together 19, of abdomen 53, of cerci 12·75; breadth of terminal joint of cerci 2; length of fore coxa 22·5, femur 28, tibia to insertion of tarsus 11; of intermediate femur 27, tibia 27; posterior femur 33, tibia 38; tegmina 42 (or reaching to end of middle third of third abdominal segment); breadth of marginal field of tegmina 3; length of stigma 6·75; length from base of tegmen to stigma 14; length of wings 35.

Hab. Victoria River, N. Australia. The type in British Museum was "captured on March 10th, 1856, by R. Elsey, Esq., during the exploring expedition under Mr. Gregory."

ARCHIMANTIS ARMATA. (Plate XXXVI. figs. 2, 2 *a*.)

A. armata, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, 4th ser. vol. xx. p. 76.

Hab. North Australia (*C. French*).

ÆTHALOCHROA ASHMOLIANA.

Vates ashmolianus, Westw. Ann. & Mag. Nat. Hist. vol. viii. p. 272; Arcana Entomol. 1843, vol. ii. p. 52 (note †).

Popa? aschmoliana, Saussure, Mél. Orthopt. tom. i. fasc. 3, p. 309.

Æthalochroa ashmoliana, Wood-Mason, Ann. & Mag. Nat. Hist. April 1877, p. 308, ♂ ♀.

Arsacia ashmoliana, Stål, Sv. Vet. Akad. Hand. 1877, Bd. iv. no. 10, 75, ♀.

A male (var. *simplicipes*) from Bombay, in the collection of Mr. F. Moore, differs from the type and from the specimens from Bengal (Calcutta and Murshidabad) in not having the crests of the four posterior femora developed into foliaceous lobes at the apex, and in having the upper crest of the four posterior tibiæ more developed and with more regularly arcuate margins, and in having the ridge of the posterior lobe of the pronotum more convex longitudinally.

A gigantic female (var. *insignis*) in the India (*olim* E.-I. Company's) Museum, South Kensington, marked "N. India," has the lobes at the extremities of the four posterior femora more highly but less regularly developed; this specimen measures:—

Total length 132 millims., length of prothorax 48, of which the neck is 10, abdomen 61—as against 115, 40, 9·5, and 52, the measurements of the same parts in the Calcutta specimen of the same sex.

A female in the collection of Mr. W. B. Farr (though not labelled as to locality, doubtless from Bengal) agrees exactly with the specimens from Calcutta and Murshidabad.

Genus Creobroter[1], Serville.

Creobroter pictipennis, n. sp. (Plate XXXVI. fig. 8.)

♀. Closely allied to *Cr. apicalis*, Sauss. (♀), from Assam, from which it differs in the form of the pronotum (which is slenderer and more distinctly quadrilobular), in its much narrower and less-depressed abdomen (a part which in the species mentioned, as also in *Cr. urbanus* ♀, is greatly dilated and suborbicular and depressed), in its less robust fore legs, and notably in the colour of the wings. The head also is a little smaller, its frontal spine much the same.

Organs of flight in repose, in the dried insect, extending by about a seventh of their length beyond the extremity of the fusiform abdomen, which is longitudinally strongly roof-shaped below. Tegmina bright green, yellow at the very base, furnished with a well-defined subquadrate or suborbicular bright yellow spot a short distance from the base, and with a still richer dead-yellow oval ocellus placed a little obliquely across the middle; this is bordered both on its external and on its internal margin by a curved black line; the black line that borders the base of the ocellus is but slightly curved or is a smaller segment of a larger circle, and sends forwards and inwards at its posterior end a small process, so as to present the appearance of a curved arrow that has lost one of its barbs; external black line strongly curved, or a larger segment of a smaller circle; it is preceded by an opalescent line rather broader than itself, and upon the veins and veinlets traversing which the yellow of the ocellus is continued; this is marked with three black dots, all placed in the same straight or slightly curved line, each upon one of the sectors of the organ; the yellow of the ocellus flows out, as it were, in an irregular stream from between the black bounding lines to the sutural margin, accompanied by the translucent white line only; but at the opposite side its exit is barred by the polished and slightly paler yellow oblong stigma, which there quite blocks up the interval between the ends of the black lines; the anal gusset is spotted with brown, paling towards the hinder margin, the network being pale green, very narrowly lined with hyaline, and its membranous meshes brown. Wings tricolorous, opaque at the base; the basal third of the posterior and the basal two thirds of the anterior field of a beautiful semiopaque cream-colour, slightly tinged with green; this is succeeded in the former by a broad band of clear brown (with dark amethystine reflections) lined with hyaline along the transverse veinlets, and in the latter by a narrower band of semiopaque dull vinaceous, the rest of both fields being throughout hyaline, slightly tinged and clouded with very pale greenish white, and having the venation rather distinct and also coloured pale greenish white.

The head, the pronotum, and the outsides of the fore legs bright green, concolorous with the elytra, variegated (the two first-named) and banded (the last) with yellow, much, in fact, as in *Cr. apicalis*.

[1] Neither "*Creobrota*" nor "*Creobotra*," nor "*Creoboter*," but "*Creobroter*," from κρέας, flesh, and βρωτήρ, an eater, κρεοβρωτήρ, so formed on the analogy of κρευπώλης, κρεοφάγος, κ. τ. λ.

The anterior crest of the fore coxæ is armed with eight bluntish spiniform tubercles, between some of which are one or two minuter ones; the right fore tibia has fifteen teeth on each edge; the four posterior legs are wanting.

Total length about 32 millims.; length of pronotum 7·6; breadth of pronotum at supracoxal dilatation 4·3, at constriction behind dilatation 2·6; length of tegmina 26; length of abdomen 14, breadth of abdomen 8·5.

Hab. Ceylon. Communicated by Mr. F. Moore. There is also a specimen in the Hopeian collection at Oxford.

HYMENOPUS BICORNIS.

Mantis bicornis, Stoll, Spectres et Mantes, 1787, pl. xi. figs. 44 (♀), 44 A (nymph).

Mantis coronata, Olivier, Encyl. Méth. 1792, Insectes, t. vii. p. 638.

Empusa coronata, Latreille, Gen. Crust. et Ins. t. iii. p. 91.

Hymenopa coronata, Serville, Revue, p. 19. no. 1, et Hist. Nat. des Orthopt. 1839, p. 163 ♀.

Hymenopus coronatus, Burm. Handb. d. Entom. 1839, vol. ii. p. 549.

Hymenopus bicornis, Saussure, Mél. Orthopt. i. fasc. 3, p. 291.

The larvæ and nymphs, at any rate, of this species simulate blossoms, some specimens being rose-pink, others of a beautiful wax-white colour. The thighs of the four posterior pairs of legs are expanded into huge broad pear-shaped plates; so that (according to Mr. S. E. Peal, who has discovered the species in Assam, many hundreds of miles from any of its hitherto recorded habitats) the immature insect when seated on a twig with thorax and abdomen raised at right angles to one another, with the fore legs drawn up out of sight beneath the thorax, and with the four expanded thighs spread out two on each side, the tarsi being brought to one spot, presents in form as well as in colour a most perfect and deceptive resemblance to a flower. The small Mantis (exactly resembling a pink orchis-flower) which, according to Mr. Wallace, was shown to Sir Charles Dilke in Java, and was said to attract and devour butterflies, probably belongs to the same species.

Hab. Sibságar, Assam (*S. E. Peal*); Moluccas (*Serville*); Sunda Isles. The perfect insect is represented in one of the beautiful sketches of foliage and flowers made by Miss North in Java.

PARABLEPHARIS KUHLII.

Blepharis kuhlii, De Haan, Orthopt. Orient. p. 93, tab. 18. fig. 3, ♀.

Parablepharis kuhlii, Saussure, Bull. Entom. Suisse, iii. p. 223 (1870); id. Mél. Orthopt. i. 1871, fasc. 3, p. 320, ♀.

Hab. Java (*De Haan*); "les Indes Orientales?" (*Saussure*). A larva has been obtained by Mr. A. W. Chennell, of the Topographical Survey of India, in the Naga Hills, Assam.

EXPLANATION OF THE PLATES.

(N.B. All the figures are of the natural size, except where the contrary is stated.)

PLATE XXXV.

Fig. 1. *Deiphobe laticeps*, p. 580. Male, with wings extended.
2. *Deiphobe laticeps*. Female.
2*a*. The right fore femur and tibia, from the inner side.
2*b*. Front view of the head of female, magnified twice nat. size.

PLATE XXXVI.

Fig. 1. *Archimantis monstrosa*, p. 583, ♀. The head, pronotum, and fore legs.
1*a*. Front view of the head of the same.
1*b*. One of the cerci from the side, enlarged.
2. *Archimantis armata*, p. 584, ♀. The head and pronotum.
2*a*. One of the cerci from the side, enlarged.
3. *Hierodula* (*Rhombodera*) *butleri*, p. 580, ♀ ♂. Head, pronotum, and left fore leg of a female.
3*a*. The right fore coxa, from the inside.
3*b*. Head and pronotum of a small male.
4. *Hierodula* (*Rhombodera*) *atricoxis*, p. 582, ♀ ♂. Head, pronotum, and right fore leg of a female.
4*a*. The left fore coxa, from the inside.
4*b*. Head, pronotum, and right fore leg of a male.
5. *Hierodula* (*Rhombodera*) *fratricida*, p. 581, ♂. Head, pronotum, and left fore leg.
5*a*. Right fore coxa, from the inside.
6. *Hierodula* (*Rhombodera*) *pustulifera*, p. 583, ♀. Head, pronotum, and left fore leg.
6*a*. Right fore coxa, from the inside.
7. *Hierodula* (*Rhombodera*) *taprobanæ*, p. 583, ♀. Head, pronotum, and right fore leg.
7*a*. Left fore coxa, from the inside.
8. *Creobroter pictipennis*, p. 585, ♀. Head, pronotum, and fore legs.

4. On new Genera and Species of Geodephagous Coleoptera from Central America. By H. W. BATES, F.L.S.

[Received May 11, 1878.]

The following diagnoses of new Central-American Coleoptera, of the families Cicindelidæ and Carabidæ (Geodephaga), are preparatory to the full descriptions which will be given in the work now preparing by Messrs. Godman and Salvin, entitled 'Biologia Americæ Centralis.' In that work figures will be given of all the more characteristic forms.

Family CICINDELIDÆ.

TETRACHA IGNEA.

T. carolinæ *forma similis, paullo magis angustata, supra igneo-cuprea; epistomate, thoracis et elytrorum lateribus viridi-æneis; elytris grosse confertim usque ad apices punctatis, macula apicali pallida, angusta, antice gradatim paullo dilatata; antennis articulis* 1mo–4um *subtus nigro-lineatis; femoribus quatuor posticis apice late*

nigris : corpore subtus viridi-æneo, ventris apice utrinque flavo-fasciato.

Long. 8 lin. ♂ ♀.

Hab. Chiriqui.

CICINDELA BELTI.

C. roseiventri *affinis, apud elytrorum humeros latior, his rectangulis. Saturate olivacea, elytris utrinque maculis albis quinque, scilicet una humerali, secunda antico-discoidali paullo transversa, tertia mediana lineiformi recte transversa, quarta posteriore rotundata prope suturam, quinta prope angulum posteriorem transversa; subtus viridi-ænea, lateribus cupreis et dense albo-pilosis; femoribus infra cupreis; abdomine rufo, basi cupreo-nitido.*

Long. 5½ lin. ♂.

Hab. Chontales, Nicaragua (*Belt*).

CICINDELA FLOHRI.

Elongata, capite angusto, thoracis lateribus anticis paullo rotundatis; elytris elongato-ovatis, apice obtuse rotundatis; supra rufo-cuprea subopaca, sericeo-micans, thoracis sulcis elytrorumque punctulis viridibus; elytris utrinque macula alba humerali et altera post humeros, fascia mediana omnino discoidali obliqua, et maculis quatuor subapicalibus, quarum tribus marginalibus; corpore subtus læte chalybeo, episternis rubro-cupreis, parce pilosis; abdomine toto læte rufo.

Long. 5 lin. ♂ ♀.

Hab. Mexico; San Angel, Guadalupe, near the capital (*Flohr*).

CTENOSTOMA SIGMA.

Ad sectionem Procephalus *pertinet. Cylindricum, æneo-fuscum nitidum, sparsissime griseo-hirtum, antennis pedibusque dilutioribus; capite impunctato, supra inæquali, fronte plana utrinque sulcata; elytris disperse punctulatis, apices versus sublævibus, apice obtuse sinuato-truncatis, utrinque macula parva anteriore subsuturali, et pone medium fascia valde flexuosa, S-formi, testaceo-albis.*

Long. 7 lin. ♂ ♀.

Hab. Chontales, Nicaragua (*Belt*; *Janson*).

CTENOSTOMA LÆTICOLOR.

Ad sectionem Procephalus *pertinet. Cylindricum, gracile, læte viridi-auratum, glabrum, antennis (scapo metallico excepto) tibiis tarsisque piceis; capite impunctato, fronte tubere magno rotundato, sulcis antice et postice marginato, verticis lateribus etiam sulcatis; elytris pone scutellum subumbonatis, disco prope suturam undulatis punctisque ocellaribus impressis, reliquis sparsissime, versus basin grosse, punctatis, apice breviter sinuato-truncatis, utrinque macula parva anteriore subsuturali, et pone medium fascia valde obliqua intus hamata, testaceo-albis.*

Long. 5½ lin.

Hab. Chontales, Nicaragua (*Janson*).

Family Carabidæ.

Aspidoglossa brachyderus, n. sp.

In hoc genere brevis; thorace brevi et lato. Nigro-ænea, palpis antennis pedibusque piceo-testaceis, elytris apicem versus diffuse rufescentibus; clypei margine haud emarginato, fovea frontali parva, simplici; thorace lato, convexo, antice angustato, lateribus fere ut in A. subangulata *angulatis; elytris oblongo-ovatis, versus basin paullo angustatis, fortiter striatis, striis passim crenatis, interstitio tertio tripunctato.*

Long. $2\frac{1}{4}$ lin.

Hab. Panamá.

Stenoüs olivaceus.

Elongato-ellipticus, gracilis, supra æneo-fuscus, nitidus, subtus niger, pedibus piceis, femoribus obscurioribus; antennis rufo-piceis, articulis 1mo–3um pallidis; elytris striatis; limbo alutaceo-subopaco, viridi-tincto, striis obsoletis.

Long. $3\frac{3}{4}$ lin.

Hab. Mexico (*Boucard*).

Dicœlus flohri.

Oblongo-ellipticus, niger vix nitidus; capite minus robusto, collo angustiore; thorace antice paullulum angustato, lateribus vix rotundatis, omnino lævi; elytris striis omnibus obsoletis, seriebus punctorum suturali et marginali tantum exstantibus, carina humerali brevi, valde elevata.

Long. $9\frac{1}{2}$–10 lin. ♂ ♀.

Hab. Mexico, San Angel (*Flohr*).

Polpochila mexicana.

Angusta, parva, castanea, palpis, antennis basi, pedibus margineque apicali elytrorum flavo-testaceis; foveis frontalibus usque ad oculorum marginem posticum fortiter impressis; thorace late cordato, lateribus ante basin fortiter sinuatis, angulis posticis exstantibus; elytris profunde striatis.

Long. 3 lin. ♂.

Hab. Mexico, Vera Cruz (*Boucard*).

Specimens have been distributed under the name I have adopted, given by M. de Chaudoir.

Anisodactylus rotundangulus.

Elongatus, niger, modice nitidus, pedibus piceis, antennis palpisque piceo-rufis; thorace lateribus arcuatis, angulis posticis late rotundatis, foveis posticis latis, modice impressis; elytris apice haud sinuatis, supra simpliciter striatis, impunctatis.

Long. 7–$7\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

Notiobia disparilis.

Æneo-cuprea (*elytris* ♀ *cupreo-fuscis*), *glabra; epistomate, labro,*

palpis, antennis et pedibus piceo-rufis; thorace valde transverso, ante medium late rotundato, deinde vix sinuatim angustato, angulis posticis rectis, anticis omnino rotundatis, supra impunctato, fovea basali utrinque magna irregulari, subrugata: elytris thorace basi latioribus, apice profunde sinuatis, supra (♂) fortiter striatis, interstitiis dorso subplanis, duobus marginalibus alutaceo-opacis; ♀ haud striatis, opacis, sutura costisque tribus elevatis nitidis.

Long. 6-7 lin. ♂ ♀.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA PARILIS.

Glabra, capite thoraceque chalybeis, elytris cupreo-violaceis, subtus nigra, antennis, pedibus antennisque interdum piceo-rufis; thorace valde transverso, ante medium late rotundato, deinde sinuatim angustato, angulis posticis rectis, anticis omnino rotundatis; elytris utroque sexu politis, sulcato-striatis, interstitiis omnibus valde convexis, apice sinuatis (nec dentatis).

Long. 6½ lin. ♂ ♀.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA LIMBIPENNIS.

Subcupreo-ænea, nitida; thorace valde transverso, medio rotundato-dilatato, postice modice angustato, angulis posticis vix rectangulis; elytris oblongo-ovatis, apice fortiter sinuatis et extus dentatis, profunde striatis, limbo laterali (apicem versus latiore) alutaceo subtestaceo-opaco, fovea etiam lata antico-discoidali paullo alutaceo-opaca, interstitio tertio postice unipunctato; antennis, palpis et pedibus rufo-piceis.

Long. 5½ lin. ♂.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA LEIROIDES.

Latior, supra æneo-olivacea, labro, antennis basi, palpis et pedibus rufis; thorace valde transverso, medio rotundato-dilatato, postice angustato, angulis posticis rectangulis; elytris apice paullulum sinuatis, regulariter striatis, interstitiis æqualibus, apicem versus angustioribus, marginalibus subopacis, tertio postice unipunctato, margine apicali testaceo.

Long. 7 lin. ♀.

Hab. Mexico, Vera Cruz (*Boucard*).

NOTIOBIA CUPREOLA.

Angustior, polita, nigro-ænea, elytris cupreo-violaceis; antennis (articulis 1mo–3um nigris exceptis) labro, palpis et tarsis fulvo-testaceis; thorace lateribus antice valde rotundatis, postice vix sinuatim angustato; angulis posticis fere rectis, supra impunctato, foveis basalibus latis vagis; elytris (♂ ♀) apice oblique leviter

sinuatis, supra striatis, ♀ subtilissime alutaceis sed politis, interstitio 3^io^ postice unipunctato.

Long. 4¾ lin. ♂ ♀.

Hab. Costa Rica, Irazu, alt. 6000–7000 feet (*Rogers*).

HARPALUS ALIENUS.

Oblongus, modice convexus, niger nitidus (♀ elytris sericeo-opacis), pedibus piceis, ntennis palpisque rufo-piceis, illis articulis 2°–4um basi nigris; thorace transversim quadrato, postice plusquam antice angustato, lateribus rotundatis, angulis posticis obtusis, impunctato, basi coriaceo, fovea utrinque late impressa; elytris apice (♂ ♀) sinuatim subtruncatis, fortiter simpliciter striatis, interstitiis paullo convexis, 3^io^ postice unipunctato.

Long. 5¼–6 lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

SELENOPHORUS AMBLYDERUS.

Oblongus, convexus, nigro-æneus, antennarum articulo basali palpisque rufis, pedibus picescentibus; thorace lateribus arcuatis, angulis posticis rotundatis, fovea basali utrinque parva, margine medio multistriato; elytris glabris, striatis, striis apice profundioribus, interstitiis 3^io^, 5to, et 7mo punctis seriatis parvis.

Long. 3½–4½ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

SELENOPHORUS CALLISTICHUS.

Oblongo-ovatus, elongatus, minus convexus, cupreo-æneus; antennis basi pedibusque flavo-testaceis; thorace antice gradatim, versus basin citius, angustato, angulis posticis rotundatis, basi tota haud profunde punctulata; elytris apice sinuatis, supra fortiter striatis, interstitiis alternis punctis numerosis rotundatis seriatim impressis; tarsis posticis gracilibus, elongatis; tibiis et tarsis absque spinis fortibus.

Long. 4½ lin. ♂ ♀.

Hab. Panamá (*Salvin*).

SELENOPHORUS TENUISTRIATUS.

Oblongus, cupreo-æneus, antennis basi, palpis, tibiis et tarsis rufescenti-testaceis; thorace transversim quadrato, antice minus et citius quam postice modice angustato; elytris apice haud sinuatis, tenuiter striatis, interstitiis planis, alternis conspicue seriatim punctatis.

Long. 2¾ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

SELENOPHORUS MITIS.

Oblongo-ovatus, niger, vix æneo vel chalybeo tinctus; palpis antennisque fulvo-testaceis, labro et pedibus piceis; capite lævi, foveis frontalibus obsoletis; thorace quadrato, lævi, foveis basalibus latis, vagis, lateribus paullulum arcuatis, antice gradatim, postice

vix angustato, angulis posticis obtusis; elytris apice leviter sinuatis, supra striatis, interstitiis alternis punctis parvis seriatis; tibiis anticis sparsim spinosis, tarsis dilatatis, ♂ subtus pauci-squamosis.

Long. 3½ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ATHROSTICTUS, nov. gen. *Selenophoro* affine.

Corpus elongato-ovatum, supra (præcipue elytris) dense minute punctatum. Caput ovatum, postice gradatim paullo angustatum. Oculi magni sed non prominentes, postice orbitu inclusi. Antennæ filiformes, graciles. Mentum profunde emarginatum, sinu fundo haud dentatum. Ligula angusta, apice libera, longe bisetosa; paraglossis latis ea longioribus. Elytra haud conspicue seriato-punctata. Cæteris ut in generibus Hypolitho *et* Harpalo.

Ad hoc genus *Selenoph. speciosus* (Dej.), *Pangus metallicus* (Reich.), *Hypolithus puberulus* et *H. chlænioides* (Dej.), et *Harpalus sulcatulus* (Dej.) pertinent.

ATHROSTICTUS OPALESCENS.

Oblongus, piceus, breviter erecte pubescens; labro, palpis, antennis et pedibus rufo-fulvis; capite et thorace nitidis, elytris opalescenti-micantibus; capite postice punctulato; thorace quadrato, lateribus fortiter arcuatis, angulis posticis fere rotundatis, basi late subrugose punctulatis; elytris apice leviter sinuatis, exarato-striatis, interstitiis minute crebre granulatis, 3io et 5to indistincte seriatim punctatis; corpore subtus nigro, læte opalescente; metasterno punctulato.

Long. 4 lin. ♂ ♀.

Hab. Panamá (*Salvin*).

ATHROSTICTUS SERICATUS.

Latior, oblongus, niger, omnino punctulatus, breviter erecte fulvo-pubescens; antennis, palpis et tarsis obscure rufescentibus; thorace transversim quadrato, postice vix angustato, angulis anticis haud prominulis, posticis fere rectangulis, lateribus paullulum arcuatis; elytris læte aureo-sericeo relucentibus, fortiter striatis, interstitiis densissime punctato-granulatis; corpore subtus nigro nitido, opalescente, punctulato.

Long. 6½ lin. ♀.

Hab. Mexico, Vera Cruz (*Boucard*).

BRADYCELLUS LUCIDUS.

Testaceo-rufis; elytris piceo-fuscis, politis, striis (suturali, marginalibusque exceptis) nullis; meso- et metasternis ventrisque basi nigris; capite latiore; thorace vix elytris angustiore, postice valde sinuato-angustato, angulis posticis rectis.

Long. 3 lin.

Hab. Mexico.

BRADYCELLUS SUBOBSOLETUS.

Castaneo-fuscus, subtus nigricans, antennis basi pedibusque flavo-testaceis ; elytris striis suturali et marginalibus profundis, disco striato-punctatis.

Long. $2\frac{3}{4}$–3 lin.

Hab. Mexico, near the capital (*Flohr*).

ACUPALPUS CIRCUMDATUS.

Elongato-oblongus, castaneo-fuscus ; antennis basi, palpis, pedibus margineque angusto elytrorum flavo-testaceis ; thorace postice valde angustato, lævi, basi utrinque haud foveato, parum punctato, lateribus antice fortiter rotundatis, postice sinuatis, angulis posticis prominulis rectis ; elytris striis modice impressis, haud punctatis, striola scutellari nulla.

Long. $2\frac{1}{3}$ lin.

Hab. Mexico, Vera Cruz (*Boucard*).

ACUPALPUS FLOHRI.

Elongato-oblongus, castaneo-rufus, capite supra, elytris utrinque disco, abdomineque castaneo-fuscis ; capite fronte foveolata ; thorace lateribus usque angulos posticos obtusos rotundatis, basi utrinque grosse sparsim punctato ; elytris simpliciter striatis, striola scutellari nulla.

Long. 2 lin.

Hab. Mexico, near the capital (*Flohr*).

ACUPALPUS OBESUS.

Latior, oblongo-ovatus, castaneo-fuscus, thorace et elytris indistincte castaneo-rufo limbatis ; palpis, antennis basi pedibusque fulvo-testaceis ; thorace transverso, sublunato, lateribus omnino rotundatis et angulis posticis fere nullis, supra impunctato ; elytris subpunctulato-striatis, striola scutellari elongata, obliqua.

Long. $1\frac{1}{2}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS MONTEZUMÆ.

Elongatus, gracilis, piceo-niger ; capite ovato ; oculis haud prominentibus, orbitu posteriore sensim angustato ; thorace elongato, truncato-cordato, lateribus explanato-reflexis, angulis posticis rectis ; elytris convexis, elongato-ovatis, punctulato-striatis, apice oblique sinuatis, marginibus basali et laterali explanato-reflexis ; pedibus elongatis.

Long. $4\frac{1}{2}$–$5\frac{1}{2}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS TRANSPUNCTATUS.

A. anthracino (*Dej.*) *affinis, oblongo-ovatus, niger, subtus cum pedibus nitidus ; elytris sericeo-nitentibus ; capite et thorace cyaneo-tinctis ; antennis articulo basali subtus rufo-piceo ; capite parvo, pone oculos gradatim angustato ; thorace elytris multo*

angustiore, rotundato, postice magis quam antice angustato; elytris tenuiter striatis, stria tertia 3-, *stria secunda* 2-*punctata.*

Long. 4 lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SCUTIFER.

Elongato-ovatus, niger, nitidus, supra leviter cyaneo-tinctus; antennis articulo basali rufo; capite lævi, oculis vix prominulis; thorace magno, ovato, lævi; elytris thorace vix latioribus, acute et fortiter striatis, interstitiis planis, tertio 4–5-*punctato.*

Long. $4\frac{3}{4}$–$5\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS VIXSTRIATUS.

Parvus, gracilis, fusco-æneus politissimus; palpis, antennis basi, pedibusque fulvo-testaceis; thorace subcordato-ovato, angulis rotundatis; elytris ovatis, striis vix impressis, interstitiis paullulum convexis 2^{ndo} *bi- vel tripunctato; metasterni episternis brevibus, latis, epimeris transversis.*

Long. $2\frac{3}{4}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS CONCISUS.

A. vixstriato *affinis, metathoracis episternis brevibus. Fusco-æneus, modice nitidus; palpis, antennis, pedibus, margineque deflexo elytrorum fulvo-testaceis; capite collo transversim depresso; thorace subcordato, postice sinuatim angustato, angulis posticis fere rectis, margine laterali explanato-reflexo, fulvo; elytris ovatis apice oblique sinuatis, supra acute striatis, interstitiis planis, tertio tripunctato.*

Long. 3–$3\frac{1}{4}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SUFFECTUS.

A. conciso *simillimus: differt elytris ampliori bus, thorace angustiore marginibus lateralibus anguste reflexo-marginatis, postice magis sinuatis, antice angulatim rotundatis. Castaneo-fuscus; palpis, antennis pedibusque fulvo-testaceis, margine angusto thoracis, epipleurisque elytrorum obscure testaceis; elytris acute striatis, apice oblique fortius sinuatis, interstitio* 3^{io} *tripunctato.*

Long. $3\frac{1}{2}$ lin.

Hab. Mexico (*Boucard*).

ANCHOMENUS NUGAX.

A. conciso *affinis: differt thorace latiore, postice multo minus attenuato, antice distincte angustato. Castaneo-fuscus, vel æneo-fuscus, nitidus; palpis, antennis et pedibus piceis, raro fulvo-testaceis; thorace quadrato, paulo ante medium subangulatim*

dilatato, deinde postice paulo angustato, angulis posticis rectis, margine laterali anguste explanato-reflexo vix pallidiore; elytris minus rotundato-ovatis, apice vix sinuatim oblique truncatis, supra acute striatis, interstitiis planis, 3^io^ tripunctato; margine deflexo interdum testaceo.

Long. 3¼ lin. ♂ ♀

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SIMPLICIOR.

A. nugaci *proxime affinis: differt tantum thorace paullulum angustiore, lateribus antice æqualiter rotundatis nullomodo angulatis, postice vix conspicue sinuatim modice angustato, angulis fere rectis, margine laterali angustissime explanato haud pallido: piceo-niger, vix æneo-tinctus, antennis palpis et pedibus piceo-rufis; elytris ovatis, subtiliter striatis etc. ut in præcedentibus.*

Long. 3 lin.

Hab. Mexico, near the capital (*Flohr*).

GLYPTOLENUS, nov. gen. *Anchomeno* affine.

Corpus gracile. Caput angustum, ovatum. Mentum sinu dente magno elongato. Palpi nudi, articulis terminalibus cylindricis. Thorax angustus, ante medium angulatim dilatatus, dorso grosse transversim rugatus. Elytra ampla, convexa, apice haud sinuata, supra fortiter sulcata. Prosternum apice marginatum, prominulum. Metasterni episterna elongata. Pedes graciles; tibiæ et tarsi fortiter sulcata; tarsorum articulis 1°-4um latitudine æquales, plantis pubescentibus, 4to emarginato.

GLYPTOLENUS RUGICOLLIS.

Niger, subnitidus; thorace capite vix latiore, oblongo, postice sinuatim paulo angustato, angulis posticis subrectis, supra grosse rugato; elytris latis, convexis, apice rotundatis, supra grosse profunde striatis, interstitiis convexis; antennis, palpis, tibiis et tarsis piceo-fulvis. ♀.

Long. 3¼ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES STRICTICOLLIS.

Elongatus, niger, nitidus; palpis, antennarum articulis 4°-11um tarsisque piceo-rufis; thorace fere orbiculari, basi fortiter constricto, marginibus lateralibus rotundato-explanatis, supra lævi, polito; elytris convexis, marginibus lateralibus explanatis lævibus, apice vix sinuatis, supra valde convexis, sulcato-striatis.

Tarsi articulo 4to latiusculo, emarginato, subtus sublonge setoso, articulis 1°-3um quatuor posteriorum supra bisulcatis.

Long. 6 lin.

Hab. Chontales, Nicaragua (*Belt, Janson*).

COLPODES INTERGENEUS.

Gracilis, piceo-niger; elytris purpureo-fuscis; palpis, antennis pedibusque pallide testaceis; capite collo supra transversim depresso; thorace angusto, quadrato, antice paulo rotundato-dilatato, postice vix sinuatim modice angustato, angulis posticis distinctis subobtusis, margine laterali angusto; elytris elongato-ovatis, apice oblique (haud sinuatim) truncatis, supra subtiliter subpunctulato-striatis, interstitiis planis, tertio 3-punctato.

Tarsi 2 antici articulo 4to latiusculo, breviter bilobo, subtus longe setoso.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES GRATUS.

Elongato-ovatus, convexior, subæneo-niger; palpis, antennis, tibiis et tarsis piceo-rufis; palpis articulo ultimo sublineari; thorace ovato, lateribus æqualiter rotundatis, paullo ante basin sinuatim citius angustatis, angulis posticis subobtusis, margine æqualiter anguste explanato; elytris apice leviter sinuatis, interstitiis paululum convexis, 3^io^ puncto unico solum conspicuo.

Tarsi articulo 4to subtus longe setoso, quatuor anteriorum breviter bilobo, lobis inæqualibus.

Long. $4\frac{3}{4}$–5 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES DUPLEX.

Elongato-ovatus, subæneo-niger, elytris purpureo-fuscis; palpis, antennis (art. 5°–11um dilutioribus) pedibusque rufo-piceis; thorace quadrato, ante medium rotundato-dilatato, deinde paullo vix sinuatim angustato, angulis posticis subrectis; elytris apice oblique sinuatis, striatis, interstitiis planis (versus apicem convexis), 3^io^ tripunctato, puncto anteriore interdum deficiente; elytris raro æneo-fuscis.

Tarsi, articulo 4to subtus sparsim longe setoso, quatuor anteriorum brevissimo bilobo.

Long. $3\frac{1}{2}$–4 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES OBSCURELLUS.

Elongatus, vix convexus, nigro-olivaceus æneoscens; palpis apice flavo-testaceis, antennarum articulis 3 basalibus et tarsis piceis; thorace parvo, quadrato-cordato, transverso, lateribus antice valde rotundatis, postice sinuatim modice angustato, angulis posticis subobtusis; elytris apice fortiter oblique sinuatis, supra subpunctulato-striatis, interstitiis paullulum convexis, 3^io^ (in striis) tripunctato; metasterni episternis elongatis; epimeris postice fortiter rotundatis.

Tarsi, articulo 4to subtus longe setoso, quatuor anterioribus leviter tantum emarginatis.

Long. 5 lin.
Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES LACTIPES.

Nigro-piceus, pedibus albo-testaceis, palpis antennisque rufo-testaceis; labro et mandibulis piceo-rufis; thorace cordato, antice fortiter rotundato, postice valde angustato, ante angulos breviter recto; elytris amplis, convexis, apice sinuatis, iridescentibus, striatis, interstitio 3^io^ tripunctato; metasterni episternis elongatis.
Long. 5 lin.
Tarsi, articulo 4to latiusculo, 2 anterioribus breviter bilobis, cæteris emarginatis.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES PROCEPHALUS.

Elongatus, vix convexus, niger; elytris purpurascentibus; capite elongato, post oculos gradatim angustato, collo supra haud transversim depresso, oculis haud prominulis; palpis et antennis piceis; thorace valde elongato, oblongo-ovato, postice paullo leviter angustato, angulis posticis obtusis vel rotundatis, supra subtiliter transversim striato; elytris ellipticis, apice fortiter sinuatis, striatis, interstitio 3^io^ tripunctato; metasterni episternis brevibus quadratis.
Tarsi articulo 4to latiusculo, profunde emarginato.
Long. 5 lin.
Hab. Guatemala (*Salvin*).

COLPODES PROLIXUS.

Elongatus, gracilis, pedibus antennisque valde elongatis, castaneo-piceus, palpis, pedibus et antennis rufo-piceis; capite elongato-ovato, post oculos crasso, rotundato, oculis vix prominulis, collo paullo angustato, supra transversim depresso; thorace quam caput vix latiore, cordato, postice sinuatim angustato, angulis posticis rectis, apice obtusis; elytris oblongo-ellipticis, apice extus oblique truncatis, apud suturam triangulariter excisis, angulo apicali dentiformi, supra punctulato-striatis, interstitio 3^io^ tripunctato; metasterni episternis brevissimis.
Tarsi articulo 4to profunde emarginato, lobulis valde inæqualibus.
Long. 6 lin.
Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES PARVICEPS.

Ellipticus, æneo-olivaceus, politus, antennis tibiis et tarsis rufo-testaceis; palpis piceis, articulo ultimo apice attenuato rufo; capite parvo, oculis prominulis, mox pone oculos angustato; thorace quadrato, antice longe postice paullulum angustato, marginibus explanatis, angulis posticis rectis; elytris oblongis, prope basin transversim convexis, apice leviter sinuatis, dorso striato-punctulatis, striis prope basin evanescentibus, prope apicem incisis; metasterni episternis elongatis, angustis.

Tarsi articulo quarto profunde emarginato, lobulis valde inæqualibus.

Long. 4 lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES AUROTINCTUS.

Parvus, elongato-ovatus, supra nigro-æneus; elytris aurato-æneis viridi tinctis, politis; palpis, antennis, trochanteribus et tarsis rufo-piceis; corpore subtus femoribus tibiisque nigro-piceis; capite gracili, collo angustato, supra transversim depresso; thorace quadrato, lateribus fere regulariter paullo rotundatis, postice paullulum magis quam antice angustato, angulis obtusis, margine explanato rufescente; elytris ovatis, subtiliter acute striatis, interstitiis planissimis; metasterni episternis vix elongatis.

Long. $3\frac{1}{4}$ lin.

Tarsi articulo 4to quatuor anteriorum profunde emarginato vel bilobo, duorum posteriorum modice emarginato, lobulis paullo inæqualibus.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES PROSTOMIS.

Elongato-oblongus, niger, nitidus, elytris violaceo-tinctis, palpis gracilibus antennisque rufo-piceis; capite mox pone oculos angustato, collo cylindrico, supra depresso; mandibulis valde elongatis; thorace elongato-quadrato, supra lævissimo; antice prope angulos angustato, postice longius et minus, vix sinuatim, angustato, angulis posticis subrectis apice obtusis, margine laterali subæqualiter explanato-reflexo; elytris oblongis, valde convexis, apice sinuatis, fortiter, prope apicem profundius, striatis, interstitiis paullo convexis, 3^io^ tripunctato; metasterni episterni brevibus.

Tarsi, articulo 4to bilobo, lobulis valde inæqualibus.

Long. $6\frac{1}{2}$–7 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES CYANOSTOLUS.

C. cyanonoto *affinis; differt thoracis angulis posticis fere rotundatis. Oblongus, violaceo- vel chalybeo-niger, supra cæruleus; thorace lateribus regulariter rotundatis, angulis posticis obtusis; elytris subtilissime punctulato-striatis, striis apice haud profundioribus.*

Tarsi, articulo quarto bilobo, lobulis valde inæqualibus.

Long. $5\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES CHONTALENSIS.

C. cyanonoto *affinis, niger; elytris viridi-æneis, fortiter punctulato-striatis, striis apice haud profundioribus, interstitiis paulo convexis; thorace quadrato, lateribus regulariter rotundatis, postice haud sinuatis; antennis rufo-piceis.*

Long. 5½ lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES LEBIOIDES.

C. chalybeo *affinis, niger, capite thoraceque æneo-tinctis, elytris cæruleis; antennis tarsisque rufo-piceis; capite parvo, mox pone oculos angustato; thorace parvo, quadrato, medio leviter dilatato, angulis posticis subrectis; elytris latiusculis et brevibus, paulo convexis, apice haud sinuatis, acute striatis, interstitiis planis.*
Tarsi supra trisulcati.
Long. 3–3¾ lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES PRINCEPS.

C. cæruleomarginato *affinis, cæruleus, elytris læte purpureo-cupreis; thorace antice magis quam postice angustato, medio subangulatim dilatato, lateribus postice nullomodo sinuatis, angulis posticis obtusis; elytris striato-punctatis, margine incrassato cæruleo.*
Long. 5½ lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES SUPERBUS.

C. cæruleomarginato *affinis, nigro-politus, elytris læte aureo-cupreis; palpis, antennis et tarsis rufo-piceis; capite mox pone oculos prominentes angustato: thorace medio fortiter dilatato, antice gradatim postice citius et valde sinuatim angustato; angulis posticis exstantibus, rectis: elytrorum striis vix conspicuis.*
Long. 6¼ lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES VIRIDIAURATUS.

C. cæruleomarginato *affinis, subtus chalybeus, supra læte viridi-æneis, elytris interdum viridi-auratis vel cupreo-auratis; capite mox pone oculos prominentes angustato; thorace valde transverso, lateribus regulariter rotundatis, postice haud sinuatis, angulis posticis haud exstantibus, vix rectis; elytris conspicue striato-punctatis.*
Long. 7 lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES CHRYSOPTERUS.

Elongatus, niger nitidus, elytris aurato-æneis; thoracis margine, palpis, antennis et tarsis rufescenti-piceis; capite mox pone oculos magnos subito angustato; thorace fere ut in C. cæruleomarginato, *medio rotundato-dilatato, lateribus postice sinuato-angustatis, angulis posticis subrectis; elytris elongatis, striato-punctatis, versus apicem striis acute incisis et minus punctulatis.*
Tarsi lati, subtus dense pubescentes, articulo 4to bilobo.
Long. 5½ lin.
Hab. Chontales, Nicaragua (*Belt*).

COLPODES PROLONGATUS.

Valde elongatus, elegans, viridi-æneus, elytris læte aureo-cupreis; capite pone oculos elongato, gradatim angustato; thorace ovali, angulis posticis rotundatis; elytris apice sinuatis, longe productis sed haud spinosis, striatis, striis passim æqualiter fortiter incisis, interstitiis planis.

Tarsi articulo quarto 2 *anteriorum bilobo,* 4 *posteriorum emarginato, lobulis haud prolongatis.*

Articulo unguiculari biseriatim setoso.

Long. $6\frac{1}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

LEPTOTRACHELUS PUNCTICOLLIS.

Fulvo-testaceus, immaculatus, pedibus pallidioribus; capite lævi, post oculos paullo rotundatim angustato, convexo; thorace antice prope apicem distincte angustato, ante medium rotundato-dilatato; supra passim punctulato, versus angulos posticos grossius punctato; elytris depressis, punctato-striatis.

Long. $4\frac{1}{4}$–$4\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Janson*).

LEPTOTRACHELUS PANAMENSIS.

Fulvo-testaceus fuscescens, sutura angusta plagaque apicali nigro-fuscis; antennis et pedibus pallidioribus: capite lævi; thorace antice prope apicem angustato, lateribus anticis leviter rotundatis, ante basin paullo sinuatis, supra punctato et medio dorsi punctato-rugoso.

Long. $4\frac{1}{4}$ lin.

Hab. Panama.

CELIA COSTARICENSIS.

Oblongo-ovata, nigra, polita, plus minusve ænescens vel fusco-ænea; antennis piceo-nigris, articulis 1° *et* 2° *vel* 1°–3um *rufis; thorace convexo, mox pone angulos anticos rotundato-dilatato, deinde usque ad basin leviter arcuato vel subrecto, basi utrinque foveolis duabus distantibus lævibus, interiore recta, exteriore versus angulum oblique ducta; elytris prope apicem angustatis et compressis, striatis, striis lateralibus evanescentibus, striola scutellari ad basin secundæ oriente suturam haud attingente, interstitiis paullo convexis; pedibus piceis, tarsis pallidioribus; prosterni apice dilatato subtruncato.*

Long. 4 lin.

Variat. 1, *elytrorum interstitiis planissimis;* 2, *striis subtilissimis subpunctulatis;* 3, *forma abbreviata, ovata.*

Hab. Irazu, Costa Rica, alt. 6000–7000 (*Rogers*).

CURTONOTUS PUTZEYSI.

Elongato-oblongus, niger nitidus, subtus cum pedibus picescens, antennis et palpis piceo-rufis; thorace lateribus valde rotundatis, juxta basin fortiter subito constricto, angulis posticis rectis, limbo

antice et postice grosse punctato ; elytris thorace vix latioribus, parallelis, striis conspicue punctatis, omnibus acute impressis.
♂ tibiis intermediis medio intus haud dentatis.
Long. 7½ lin. ♂ ♀.
Hab. Mexico, near the capital (*Flohr*).
Differs from *C. substriatus* by its larger size and more robust proportions, and by the stronger and more uniform striation of the elytra. The ♂ is destitute of the broad tooth on the inner side of the middle tibiæ. Immature individuals are reddish piceous with paler margins.

DIPLOHARPUS EXSTRIATUS.

Oblongo-ovatus, supra lævissimus æneo-relucens, subiridescens ; partibus oris, antennis pedibusque fulvis ; mandibulis longissimis, rectis ; thorace ovato, marginibus postice explanato-elevatis, angulis posticis rotundatis ; elytris absque striis, marginali excepta.
Long. 3¾ lin.
Hab. Chontales, Nicaragua (*Belt*).

PERICOMPSUS LONGULUS.

Elongatus, parallelogrammicus, castaneo-piceus, capite marginibusque thoracis rufis ; elytris fulvo-testaceis plaga mediana oblonga communi (postice usque ad marginem dilatata) nigro-picea ; partibus oris, antennis pedibusque pallidis ; thorace transverso, postice fortiter sinuatim angustato, angulis posticis rectis, marginibus paullo explanato-reflexis.
Long. 1 lin.
Hab. Mexico, near the capital (*Flohr*).

XYSTOSOMUS BELTI.

Elongato-ovatus, modice convexus, politus, viridi-æneus, elytris aureo tinctis ; antennis fulvis, pedibus rufo piceis, corpore subtus piceo ; foveis frontalibus longis ab sulculo oculari utrinque carina separatis ; oculis maximis ; thorace transverso, antice prope angulos fortiter rotundato-angustato, postice haud angustato, angulis posticis rectis ; elytris striis punctulatis novem, 1ma–3tiam vix impressis (1ma versus apicem excepta), 4a–7am apice evanescentibus.
Hab. Chontales, Nicaragua (*Belt*).

XYSTOSOMUS OLIVACEUS.

X. belti *affinissimus ; differt colore supra omnino olivaceo-æneo, antennis obscure cinereis, articulis 4 basalibus piceis ; thorace transverso, antice subito rotundato-angustato, postice haud angustato, sed leviter sinuato, angulis posticis acutis ; elytris paullo convexis, ovatis, mox pone humeros rotundato-dilatatis, margineque explanato et fortiter reflexo, punctulato-striatis, striis 1a–3am vix impressis ; pedibus et palpis obscure piceis, articulo subulato rufo.*
Long. 2¼ lin.
Hab. Chontales, Nicaragua (*Belt*).

TACHYS DIPLOHARPINUS.

Oblongus, modice convexus, sericeo-nitens, subopalescens; partibus oris, antennis pedibusque fulvis; mandibulis acute hamatis; oculis prominulis; foveis frontalibus fortiter impressis, post oculos curvatis; thorace lato, postice modice sinuato-angustato, angulis posticis exstantibus acutis, margine laterali elevato-explanato; elytris lævibus, stria suturali solum fortiter impresso, striola apicali recurva fortiter impressa, apice setifero, foveis irregularibus duabus submarginalibus, puncto discoidali mediano.

Long. 1½ lin.

Hab. Chontales, Nicaragua (*Janson*).

A species remarkable for its many points of resemblance to the genus *Diploharpus*.

BEMBIDIUM (NOTAPHUS) FLOHRI.

Oblongum, parallelogrammicum, depressum, æneum nitidum, elytris pallido-testaceis, regione scutellari, gutta utrinque discoidali, maculaque majore postmediana transversa fuscis; palpis, antennis et pedibus fulvo-testaceis; sulcis frontalibus modice impressis simplicibus; capite lævi; thorace postice angustato, angulis posticis obtusis fere rotundatis, supra medio basi strigoso, fovea utrinque vaga, lata, rugulosa, carinaque acuta oblique ad angulum posticum ducta; elytris thorace vix latioribus, integriter punctulato-striatis, interstitiis planis, tertio tripunctato.

Long. 2–2¼ lin.

Hab. Mexico, near the capital (*Flohr*).

The species belongs to an unnamed group near *Notaphus*, and is only referred to the latter for general guidance as to its position.

BEMBIDIUM (NOTAPHUS) PLACITUM.

Elongato-oblongum, depressum, viridi- vel subcupreo-æneum, elytris cupreo-fuscis (♂ nitidis, ♀ subopacis) vitta laterali ab humero usque medium, intus biloba, fasciaque maculari ante apicem, fulvo-testaceis; sulcis frontalibus latis haud profundis; thorace late rotundato, postice magis quam antice angustato, angulis posticis obtusis, fovea media profunda carinaque parva juxta angulum; elytris subtiliter punctato-striatis, interstitiis planissimis, tertio 3-punctato; palpis, antennis pedibusque obscure piceis.

Long. 3 lin.

Hab. Mexico, near the capital (*Flohr*).

This species has been mistaken for *N. semifasciatus* of Say. His description, however, suits much better an equally common and similar, but smaller, Mexican species.

BEMBIDIUM (PERYPHUS) ROGERSI.

Gracile, convexiusculum, nigro-æneum, pedibus piceis, antennarum articulo basali subtus rufo; thorace anguste cordato, antice rotundato, postice sinuatim angustato, angulis posticis rectis, basi transversim depresso, vage punctato, foveis profundis carinaque elevata ad marginem fere parallela; elytris punctulato-striatis,

interstitiis convexis paulo undulatis, tertio foveis duabus magnis vagis impressis, stria 7ma obsoleta.

Long. $2\frac{1}{4}$ lin.

Hab. Costa Rica, Mount Irazu, alt. 6000–7000 feet (*Rogers*).

BEMBIDIUM (PERYPHUS) SUBMACULATUM.

Elongato-ovatum, modice convexum, fusco-æneum, elytris utrinque versus apicem macula obliqua flavo-testacea; antennis piceis, articulo 1mo et 2do–4tum basi pedibusque flavo-testaceis; palpis maxillaribus articulo penultimo obscuro; thorace transversim quadrato, antice modice rotundato, postice leviter sinuatim angustato, angulis posticis subrectis, fovea basali profunda vage rugosa, carinaque obliqua juxta angulum; elytris subtiliter striato-punctulatis, striis interdum magis impressis, 7ma abbreviata, exterioribus omnibus versus apicem obliteratis, interstitio 3io bipunctato.

Long. $2\frac{1}{6}$ lin.

Hab. Mexico, near the capital (*Flohr*).

Specimens received from Paris as "*submaculatum*, Chaud. MSS.," have the striæ impressed; in Mr. Flohr's specimens the rows of fine clear punctures are superficial. The nearly allied *B. mexicanum*, Dej., is much larger, and has a short curved fold instead of a distinct carina at the hind angles of the thorax.

LACHNOPHORUS SEMIRUFUS.

Breviter oblongus, erecte pilosus, capite thoraceque rufis, elytris pectore abdomineque nigro-æneis, palpis antennis pedibusque flavo-testaceis; capite postice modice angustato, oculis minus prominulis, vertice grossissime punctatis; thorace late cordato, versus basin modice angustato, grossissime intricato-punctato; elytris quadratis, fortiter punctato-striatis, interstitiis supra paulo planatis, crenulatis, tertio 3-foveato.

Long. $2\frac{1}{3}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

LACHNOPHORUS LEUCOSCELIS.

L. lævicolli (Reich.) *proxime affinis. Elongatus, nigro-æneus, nitidus, supra glaber; palpis antennarumque articulis 4 basalibus rufo-testaceis; tibiis (apice excepto) albo-testaceis; capite (cum oculis) quam thorax latiore, punctis magnis conspersis; thorace rotundato-cordato, valde convexo, postice fortiter angustato, basi constricto et depresso, fere impunctato, polito; elytris profunde striatis, striis a basi usque paulo ultra medium grosse punctatis.*

Long. vix 2 lin.

Hab. Chontales, Nicaragua (*Belt*).

LACHNOPHORUS LONGULUS.

In hoc genere elongatus, convexior, olivaceo-æneus, breviter setosus; elytris sordide fusco-albis, pone medium fascia irregulari fusca prope suturam valde dilatata; antennis piceo-fuscis, articulo basali infra rufo; femoribus flavo-testaceis, basi et apice piceo-nigris;

tibiis et tarsis piceis, illis dimidio basali rufo-piceis ; capite longitudinaliter vage striato ; thorace angusto, elongato-ovato, lateribus anticis modice rotundatis, basi angustata, angulis posticis haud exstantibus, supra viridi-æneo subtiliter alutaceo et punctulato ; elytris oblongis, apice distincte sinuato-truncatis, fortiter exarato-striatis, striis dimidio basali punctatis, interstitiis planis, seriatim punctulatis, disco utrinque 3-foveatis.

Long. $2\frac{1}{3}$ lin.

Hab. Chontales, Nicaragua (*Belt, Janson*).

LACHNOPHORUS SCULPTIFRONS.

L. elegantulo *similis. Gracilis, breviter pallido-hirsutus, viridi-æneus ; antennarum articulo basali infra, 2°–4um basi, femoribus (annulo basali et genibus exceptis) tibiisque (apice excepto) rufo-testaceis ; elytris albo- et flavo-testaceis, fascia ultra medium fusco-ænea ; capite crebre longitudinaliter strigoso et punctato, thorace elongato-cordato, paullulum dilatato, alutaceo-opaco et sparsim punctulato ; elytris acute striatis, striis basi punctatis, interstitiis planatis uniseriatim punctulatis, disco trifoveato, foveola anteriore solum conspicua.*

Long. 2 lin.

Hab. Guatemala, Chinautla, alt. 4100 feet (*Salvin*); Chontales (*Belt*).

CHALYBE BELTI.

Gracilis, subæneo-nigra, breviter griseo-setosa, setis longioribus nigris commixtis ; antennis ut in gen. Ega brevibus extus incrassatis, brevius hirsutis, articulis tribus basalibus flavis, 4to–7^mum^ nigro-fuscis, 8vo–11^mum^ albis ; capite grosse reticulato-punctato ; thorace gracile cordato, grosse discrete punctato ; elytris pone basin valde transversim depressis, acute exarato-striatis, interstitiis summis planatis, distanter lineato-punctatis, utrinque fasciis angustis brevibus macularibus testaceo-allis duabus ; pedibus albis, femoribus, tibiis tarsisque apice fuscis.

Long. $1\frac{3}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

CASNONIA TUBULIFERA.

Subæneo-niger, elytris macula anteriore antice ramum ad basin emittente, altera apicali marginibusque rufo-testaceis ; antennis pedibusque rufescentibus ; capite lævi, mox pone oculos subito constricto, deinde in collum tubuliforme prolongato ; media fronte bicallosa ; thorace minus elongato, grosse punctato ; elytris oblongis, politis, nudis, apice leviter sinuatim truncatis, angulo exteriore obtuso, supra striato-punctatis, striis interioribus quatuor post medium interruptis, interstitio tertio trifoveato, calloque posteriore submarginali.

Long. 3 lin.

Hab. Chontales, Nicaragua (*Belt*).

CALOPHÆNA CRUCIATA.

C. acuminatæ (*Oliv.*) *affinis. Nigro-cyanea, nitida; elytris utrinque maculis magnis quadratis duabus (interstitia sex occupantibus) albo-testaceis, basi et apice anguste cruceque mediana nigro-cyaneis; thorace valde elongato, antice magis quam postice recte angustato; elytris punctulato-striatis, interstitiis modice convexis; antennis articulis* 5°–11um *fulvis.*

Long. 6½ lin.

Hab. Chontales, Nicaragua (*Belt*).

CALOPHÆNA LÆVIGATA.

C. acuminata (*Ol.*) *affinis. Colore lætius cyanea; elytris medio violaceis, striis (apud maculas albas exceptis) nullo modo impressis; thorace valde elongato, antice subrotundatim, postice sinuatim angustato; elytris aculeatis, maculis utrinque duabus transversis, albo-testaceis, prima interstitia* 5, *secunda* 6 *occupante.*

Long. 6½ lin.

Hab. Panamá.

CATASCOPUS CHONTALENSIS.

Supra læte viridi-æneus, elytrorum limbo aurato, pectore et pedibus nigro-piceis, abdomine castaneo; capite post oculos gradatim modice angustato, sed haud elongato, oculis valde exstantibus; thorace transverso vel late cordato, angulis anticis modice provectis, margine exteriore late explanato et valde rotundato usque ad summum angulum, postice sinuatim angustato, angulis posticis exstantibus acutis; elytris punctato-striatis, interstitiis vix convexis.

Long. 6 lin.

Hab. Chontales, Nicaragua (*Belt, Janson*), 4 exempl.

The elytra viewed from the front against the light have a delicate milky opalescent bloom, as in *C. validus*, to which the species is very closely allied.

CATASCOPUS ANGULICOLLIS.

Supra viridi-æneus, corpore subtus pedibusque nigro- vel rufo-piceis, abdomine castaneo; capite mox pone oculos subito angustato; thorace subquadrato, angulis anticis angustis prominulis, margine explanato, laterali angusto, ante medium angulato, postice sinuatim angustato, angulis posticis prominulis acutis, supra distinctius transversim strigato, margine explanato grosse punctato; elytris punctato-striatis, interstitiis paullulum convexis.

Long. 6 lin.

Hab. Chontales (*Belt*).

COPTODERA SCINTILLANS.

C. acutipenni (*Buq.*) *affinis. Elongato-oblonga, supra capite thoraceque aurato-viridibus politissimis, elytris aurato-cupreis; partibus oris, epistomate, antennis, corpore subtus pedibusque fulvo-testaceis, tibiis obscuris; thorace valde transverso, lateribus rotundatis nullo modo angulatis, margine late elevato-explanato,*

impunctato; elytris amplis, truncaturæ angulis acutis sed non ut in C. acutipenni *productis, subtiliter punctato-striatis, striis vix impressis, interstitiis planis.*

Long. 5 lin.

Hab. Chontales, Nicaragua (*Belt*).

EURYCOLEUS BELTI.

E. 13-punctato (*Chaud.*) *proxime affinis, differt maculis paucioribus magnitudineque æqualibus. Latus, ovatus, testaceo-rufus; elytris flavo-testaceis, maculis utrinque 7 margineque subapicali nigris; antennis rufescentibus, articulis* 1° (*apice*) *et* 2°–4um, *palpis* (*apice excepto*), *femoribus apice, tibiis et tarsis nigris; elytrorum maculis* 3 *suturalibus* (*apicali communi antice dilatata*), 1 *subhumerali*, 2 *medianis*, 1 *rotunda subapicali, a margine laterali longe separata.*

Long. 5 lin.

Hab. Chontales, Nicaragua (*Belt*).

APENES COMIS.

Ad sectionem A. purpuripennis *pertinet.* A. sinuata *paulo major, præcipue latior, supra plana, subopaca, fusco-ænea, antennis palpis pedibusque fulvis; capite fere lævi, subtiliter alutaceo, vix ruguloso; thorace late cordato, angulis posticis dentiformibus, basi media arcuata, sublobata, versus angulos subsinuata, lateribus marginulo explanato, supra passim subtiliter transversim strigato; elytris oblongis, apice subfortius sinuato-truncatis, punctulato-striatis, interstitiis planis alutaceis, fascia angusta, curvata, maculari, subapicali, rufa, interstitia* 4–8 *occupante, apud* 7^{mum} 8um*que maculis versus apicem elongatis, macula altera subhumerali minus distincta.* ♂.

Long. 4 lin.

Hab. Panamá.

PINACODERA AMBLYGONA.

P. nigritæ (*Chaud.*) *proxime affinis, differt thorace angustiore et longiore angulisque posticis omnino rotundatis. Nigra, nitida, antennis tarsisque rufo-piceis; capite impunctato; thorace transversim striolato; elytris subtiliter punctulato-striatis, interstitiis planissimis, sparsim obsolete et minutissime punctulatis.*

Long. 5¼ lin. ♀.

Hab. Mexico (*Boucard*).

PINACODERA ANGULIFERA.

P. nigritæ (*Chaud.*) *simillima, differt thorace postice latiore, angulis acutis exstantibus. Nigra, nitida, antennis tarsisque rufo-piceis; capite ruguloso, vix punctulato; thorace antice et postice subcrebre punctato; elytris acute striatis, striis subtiliter punctulatis, interstitiis vix convexis, grossius uniseriatim punctulatis.*

Long. 5¾ lin. ♀.

Hab. Mexico.

LEBIA CALLIZONA.

L. bifasciatæ (*Dej.*) *proxime affinis, differt fascia postica metallica apud suturam antice fere divisa. Lævis, testaceo-rufa, capite fasciisque duabus elytrorum latis et macula apicali cæruleis, fascia prima postice medio emarginata, fascia secunda antice ad suturam fere divisa; antennis nigris articulo basali rufo; pedibus cæruleis, femoribus basi rufis; abdomine apice subtus rufo concolori, supra nigro.*

Long. 3 lin.

Hab. Guatemala.

LEBIA CORCULA.

L. nigricipiti (*Chaud.*) *similis, at capite flavo, elytris ovatis differt. Parva, ovatula, testaceo-flava; elytris fasciis duabus nigris, prima basali (latera haud attingente) postice medio angulatim emarginata, secunda pone medium (marginem lateralem haud attingente) antice et postice medio elytro leviter sinuata, interstitio suturali inter fascias autem nigro; thorace valde transverso, apud angulos posticos valde explanato; elytris profunde punctulato-striatis, interstitiis culminatis.*

Long. vix 2 lin.

Hab. Chontales, Nicaragua (*Janson*).

LEBIA CHARINA.

L. quinquenotatæ (*Chaud.*) *simillima, differt elytrorum maculis minoribus posticisque ad suturam conjunctis. Late ovata, flavo-testacea; palpis, articulis 4to–11um antennarum, capite, femoribus apice, tibiis et tarsis, abdominis segmento anali, et elytrorum utrinque maculis* 3 *nigris; thorace quam in* L. quinquenotata *angustiore; elytris obsolete striato-punctatis; elytrorum maculis,* 1 *ovata communi scutellari,* 1 *virguliformi humerali, et* 1 *postmediana transversa, antice apud suturam indentata, latera haud attingente, apice autem anguste nigro.*

Long. 3¼ lin.

Hab. Chontales, Nicaragua (*Belt*).

LIA QUADRIANNULATA.

In hoc genere convexa, polita, subcastaneo-rufa, subtus et pedibus testaceo-rufis; antennis articulis 4°–11um piceis; thorace angustiore, antice gradatim angustato; elytris utrinque annulis duobus flavis, primo mediano-laterali, secundo versus apicem, macula autem flava subhumerali.

Long. 5 lin.

Hab. Chontales, Nicaragua (*Belt*).

OTOGLOSSA CŒLESTINA.

O. terminali (*Chaud.*) *forma similis. Supra læte cyanea; elytris violaceo relucentibus, fascia apicali flava; antennis, partibus oris, pedibus et pectore chalybeis, tarsis abdomineque flavis; thorace angusto, pone medium fortiter sinuato-angustato, basi iterum*

subito dilatato, angulis apice rotundatis; elytris supra modice inæqualibus, obsolete punctulato-striatis.

Long. $3\frac{1}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

OTOGLOSSA OBSCURELLA.

Minor, nigra; elytris leviter violaceo-tinctis, apice fascia obscure rufa ad suturam angustata; tarsis rufo-piceis; abdomine flavo; capite post oculos paulo citius rectiusque angustato, occipite minus convexo; thorace angusto, pone medium fortiter sinuato-angustato, basi iterum dilatato; elytris supra modice inæqualibus, obsolete striatis.

Long. $2\frac{1}{3}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

CALLEIDA SEMIRUBRA.

Elongato-oblonga, nigro-nitidu, elytris (basi excepta) rufo-castaneis; abdomine rufo; capite post oculos magis quam in C. metallica *incrassato, collo subito angustato; thorace quadrato, antice cum angulis rotundato, postice sinuato modice angustato, angulis posticis obtusis; elytris apice fortiter sinuatim truncatis, angulis externis dentiformibus, supra paulo inæqualibus, punctulato-striatis, interstitiis planis.*

Long. 7 lin.

Hab. Chontales, Nicaragua (*Belt*).

Taken from the stomach of a toad on the summit of a hill near St. Domingo.

CALLEIDA LÆTIPENNIS.

Subgracilis, castaneo-rufa, elytris (epipleuris exceptis) auratoæneis; capite angusto, post oculos gradatim angustato haud tumido, collo distincto; thorace quadrato-cordato, postice leviter sinuatim angustato, angulis posticis subrectis; elytris apice leviter sinuatim truncatis, angulis externis valde rotundatis, punctulato-striatis, interstitiis planis.

Long. $4\frac{1}{3}$ lin.

Hab. Chontales, Nicaragua (*Belt, Janson*).

CALLEIDA JANSONI.

C. onypterygoidi (*Chaud.*) *coloribus similis, at minus nitida, formaque multo magis parallela. Cyanea; elytris purpureo-cupreis, subtiliter alutaceis; capite post oculos citius recte angustato, haud tumido; thorace elongato-quadrato, postice vix sinuatim modice angustato, angulis subrectis, supra subfortiter transversim strigoso; elytris elongatis, parallelis, truncaturæ angulis externis valde rotundatis, fortiter vix punctulatim striatis, interstitiis paulo convexis, tertio conspicue tripunctato.*

Long. 6 lin.

Hab. Chontales, Nicaragua (*Belt, Janson*).

AGRA LÆTICOLOR.

Ad sectionem A. femoratæ (*Kl.*) *pertinet. Gracilis, viridi-ænea, antennis pedibusque rufis, femoribus basi obscurioribus; capite maxime elongato, lævi, post oculos gradatim rotundato-angustato, juxta collum haud tumidulo; thorace angusto, elongato-conico, sulcis* 4 *longitudinalibus, foveolato-punctatis, impressis, quorum duobus dorsalibus antice carina abbreviata separatis; elytris ante medium sinuatim angustatis, postice iterum dilatatis, apice utrinque flexuoso-truncatis, angulo exteriore subspinoso, suturali acute dentato, supra punctato-striatis, interstitiis inter se lineolis transversis multifariam conjunctis.*

♂ *metasterno medio, femoribusque basi infra rufo-pilosis.*

Long. 7 lin.

Hab. Chontales, Nicaragua (*Belt*).

AGRA CHRYSOPTERYX.

A. rutilipenni *proxime affinis et similis. Castaneo-rufa, elytris* (*epipleuris exceptis*) *læte viridi-auratis; capite post oculos breviter semiovato, punctis nonnullis piliferis impresso; thorace medio modice rotundato-dilatato, paulo ante apicem fere subito angustato, lineatim subsparsim irregulariter foveato-punctato, longe piloso; elytris apice subrecte oblique truncatis, angulo exteriore breviter dentato, suturali rotundato, supra acute punctulato-striatis, striis secunda et quarta* 5-6-*punctatis, stria sexta bipunctato.*

♂ *metasterno et abdomine medio longe rufo-barbatis.*

Long. 7 lin.

Hab. Chontales, Nicaragua (*Janson*).

AGRA PANAMENSIS.

Ad sectionem A. æneæ (*F.*) *pertinet; at cæteris speciebus distinctissima. Latior, nigra, partibus oris, antennis, trochanteribus, genibus, tibiis et tarsis fulvo-castaneis; capite lato, pone oculos quadrato, margine posteriore ante collum exacte recto, supra impunctato; thorace quam caput longiore, pone medium rotundato-dilatato, antice usque ad apicem gradatim angustato, supra medio fere lævi, juxta marginem sparse punctato-impresso; elytris apice arcuatim truncatis, angulo exteriore fortiter spinoso, suturali acute dentato, supra vix inæqualibus, punctato-striatis, striis* 2ª *et* 4ª *seriatim rotundato-foveolatis,* 6ª *et* 8ª *magis confuse foveolatis.*

♀ *antennis art.* 8ᵛᵒ *multo abbreviato.*

Long. 12 lin.

Hab. Panamá (received from Mr. E. Bartlett).

5. Description of a new Species of *Tudicula*. By George French Angas, C.M.Z.S., F.L.S., &c.

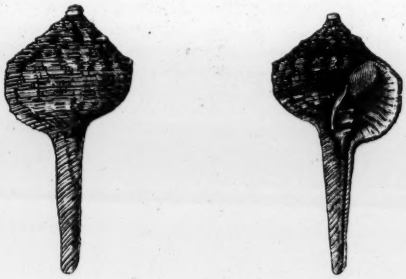
[Received May 11, 1878.]

Tudicula inermis, n. sp.

Shell globosely turbinate, solid, white, ornamented with a broad band and descending flames of an orange-chestnut colour, sculptured throughout with numerous elevated concentric ridges alternating with smaller ones, the intersticcs crossed by very fine close-set descending striæ; whorls 6½, flattened, last whorl large, tumid, flattened above and angulated at the periphery, suture impressed, apex papillary; aperture acuminately ovate; outer lip simple, arcuate, strongly grooved within; inner lip with a broad white callus spreading over the pillar, and with three transverse plaits at the lower portion of the columella; canal long, straight, somewhat longer than the entire body of the shell.

Long. 1 in. 8 lin., lat. 10 lin.

Hab. Singapore?



Tudicula inermis.

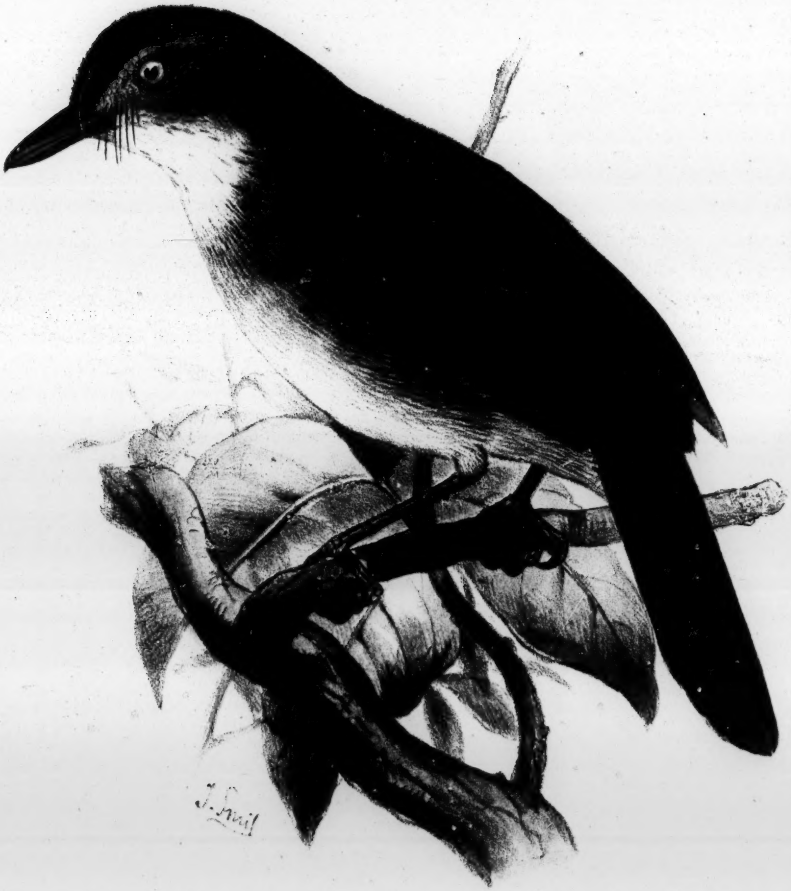
This remarkable shell belongs to the genus *Tudicula* of H. and A. Adams, constituting the third species of the genus as yet described.

The genus *Tudicula* was proposed by the learned authors of the 'Genera of Recent Mollusca' (in the Proc. Zool. Soc. 1863) for the reception of two species of shells "with spiny varices and three transverse plaits on the columella," viz. *T. armigera*, A. Ad., and *T. spinosa*, H. & A. Ad. The peculiar feature of the species now described is that it is destitute of spines, although it agrees perfectly with all the other characters of this well-marked genus, which, in my opinion, should be placed in the family Turbinellidæ.

I am indebted to my friend Dr. W. Newcomb, of Ithaca, New York, for an examination of this very interesting shell, two specimens



ZIGA EVERETTI.



J. Smit lith.

Hanhart imp.

TRICHOSTOMUS RUFIFRONS

of which were obtained from a dealer at Singapore; but the exact locality of their habitat could not be satisfactorily determined.

Care must be taken not to confuse *Tudicula* of H. and A. Adams with *Tudicla* of Bolton, of which genus *T.* (*Murex*) *spirillus* of Linnæus is the type.

6. Contributions to the Ornithology of the Philippines.—No. IX. On the Collection made by Mr. A. H. Everett in the Island of Palawan[1]. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received May 16, 1878.]

(Plates XXXVII. & XXXVIII.)

Until visited by Dr. Steere in July 1874, when he remained for a month at the Spanish settlement of Puerto Princesa, the island of Palawan, so far as is on record, had not been explored by any naturalist. Nothing was known of its zoological productions; and its exact relationship as a zoogeographical area remained an unsolved problem. During his stay at Puerto Princesa Dr. Steere collected examples of 32 species of birds, all of which have been enumerated by Mr. Sharpe[2].

At the end of November 1877 Mr. A. H. Everett arrived at Puerto Princesa, and remained until the beginning of January, when, becoming disabled by fever, he was obliged to return to Manilla to recruit his health. He, however, succeeded in collecting specimens of 52 species of birds, 32 of which are additional to those obtained by Dr. Steere. This last gentleman discovered 12 species not sent to me by Mr. Everett; so that the total of known Palawan species of birds (and all are from Puerto Princesa and its vicinity) now amounts to 64. This small number cannot exhaust the avifauna of this large island; and as Mr. Everett is now happily recovered, and has returned to Palawan, I propose postponing any remarks on the character of the Palawan ornis until we are in possession of the wider evidence which further collections will doubtless supply. Generally, however, it may be affirmed from the data before us that the birds of Palawan represent mostly Bornean genera and species, although a few distinctly Philippine types also occur.

The following species in the present collection have not hitherto been described:—

4. *Tiga everetti*.
12. *Dicrurus palawanensis*.
17. *Broderipus palawanensis*.
19. *Trichostoma rufifrons*.
20. *Drymocataphus cinereiceps*.
22. *Brachypus cinereifrons*.
25. *Criniger palawanensis*.
34. *Cyrtostomus aurora*.
39. *Corvus pusillus*.

[1] I treat Palawan as being a Philippine Island in a political sense. It remains to be shown whether it does not in fact belong, zoologically, rather to Borneo.

[2] Trans. Linn. Soc. ser. 2, Zoology, vol. i.

1. TANYGNATHUS LUZONENSIS (3).

[P. Princesa, ♂, January 1878.]
Not separable from all other Philippine examples.

2. BUTASTUR INDICUS (20).

[P. Princesa, ♂ (?), November 28, 1877 : iris bright yellow ; cere light wax-yellow ; bill and nails black ; legs and feet dull yellow.]

3. CHRYSOCOLAPTES ERYTHROCEPHALUS.

Chrysocolaptes erythrocephalus, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 315. no. 13, t. xlvi. f. 1.

[P. Princesa, ♂, December 2, 1877 : iris crimson ; bill pale yellow tinged with green ; feet and claws grey-green. ♀, November 27 : iris crimson ; bill pale yellow tinged with green ; feet and claws greyish green.]

The male example is in full adult plumage. That of the female (hitherto undescribed) resembles the male in all respects excepting the crown of the head and the crest, the feathers of which are ruddy brown, each being tipped with a pale rusty-yellow drop or spot. The cheeks, chin, and throat are washed with dilute crimson, not intense as in the male.

4. TIGA EVERETTI. (Plate XXXVII.)

Tiga javanensis (Ljungh.), Sharpe, *t. c.* p. 315. no. 14?

Three examples, two of the adult male and one of the adult female, were obtained near Puerto Princesa by Mr. Everett. They probably belong to the species doubtfully identified by Mr. Sharpe (*l. c.*) with *T. javanensis*. From this species, as well as from all the other species of the genus known to me, the present bird differs in the female having the head and crest uniform dark brown, the latter being broadly terminated with crimson. The lower part of the throat and the upper breast are uniform buffy brown, and not squamate.

Male. Forehead, crown and crest, uropygium, and upper tail-coverts crimson. Many of the dorsal plumes washed with crimson. Lores buffy brown. Space behind the eyes creamy white, each feather narrowly margined with pale brown. A patch commencing below the posterior angle of the eye and including the ear-coverts dark brown, this colour being continued as a narrow band round the occiput. Space below the eye buffy cream-colour, which is continued as a narrow line on the cheek, and expands into a broad stripe down the sides of the neck. A brown stripe commencing at angle of mouth and descending down the sides of the neck ; a few crimson feathers on the inner edge of this stripe. Chin and upper throat buffy cream-colour, many of the feathers tipped dark brown. Lower throat and crop uniform buffy brown. Breast-feathers pale yellow, very narrowly margined and boldly centred with dark brown ; within the brown centres a pale yellow stripe of varying dimensions. Abdominal and ventral feathers and the under tail-coverts pale yellow, with generally two cross bands of

dark brown. Back, wing-coverts, outer edges of secondaries, and exposed surface of tertiaries and scapulars golden. Primaries and rectrices dark brown.

Female. Differs from the male in having the top of the head dark uniform brown, almost black, the crest-plumes being terminated with crimson.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂....	5·37	4·12	1·00	1·37
♀....	5·37	4·12	1·00	1·37

In one example (♂) the lower breast-markings are not so well defined, and the general markings of the lower surface are less pronounced. The upper tail-coverts are mostly black, some only being tipped with crimson, others with golden.

[P. Princesa, ♂, November 25, 1877: iris dark brown; bill black, basal half of mandible grey; feet greenish, nails grey. P. Princesa, ♀, November 27, 1877: iris crimson; other parts as in ♂.]

5. EURYSTOMUS ORIENTALIS (37).

[P. Princesa, ♀, November 29, 1877.]

6. CACOMANTIS MERULINUS (57)?

[P. Princesa, ♂, December 10, 1877; iris bright salmon-red; bill black, mandible light brown; feet yellow, claws black.]

A single example, not sufficiently mature to be identified with certainty.

7. SURNICULUS LUGUBRIS.

Cuculus lugubris, Horsf. Tr. L. S. xiii. p. 175.

[P. Princesa, ♀, December 6, 1877: iris dark brown; bill black; feet dark grey.]

8. PHŒNICOPHAES HARRINGTONI.

Dryococcyx harringtoni, Sharpe, *t. c.* p. 321. no. 34, f. 1.

[P. Princesa, ♂, November 29, 1877: iris light brown; orbital and loral space deep crimson; bill light green, tinged with olive; feet and legs lead-grey; nails dark grey. ♀, December: iris brilliant yellow, with ring of ochreous orange.]

Of other males Mr. Everett notes the iris as being reddish brown.

This Coucal is a representative form of *P. curvirostris* and *P. erythrognathus*, closely resembling both species, but differing structurally in the shape and position of the nostril. Mr. Sharpe (P. Z. S. 1873, p. 604) has generically separated *P. curvirostris* from *P. erythrognathus*, on account of the shape and position of the nostrils in those two species being different, and for the same reason has established (*l. c.*) the genus *Dryococcyx* for the reception of this Palawan

representative form[1]. That three birds, one inhabiting Java, another Borneo, the Malay peninsula, and Sumatra, and the third Palawan, all so closely resembling each other in their colouring and markings that they are difficult to recognize without careful comparison of their shades and tints, should possess nostrils structurally differing in all three is remarkable; but is it a sufficient reason to place them in three different genera? I can only regard the character as being specific.

The plumage of the sexes is alike. The amount of dark chestnut on the middle pairs of rectrices varies considerably, from three inches to one inch in depth.

9. Centrococcyx eurycercus.

Centropus eurycercus, A. Hay, Blyth, J. A. S. B. 1845, p. 551.

[P. Princesa, ♂, January 8, 1878: iris bright crimson; bill, legs, and feet black. ♂ (juv.), December 9, 1877: iris neutral tint; bill and legs jet-black.]

Rather smaller than the Malaccan type.

10. Lanius luzionensis (72).

[P. Princesa, ♂ ♀, December 6 and 11, 1877.]

11. Graucalus sumatrensis.

Ceblepyris sumatrensis, S. Müller, Verh. Land- en Volkenk. p. 191.

[P. Princesa, ♀, December 1877: iris light lemon-yellow.]

Does not differ from Sumatran, Malaccan, and Bornean examples.

12. Dicrurus palawanensis.

In the Philippines three species of Dicruridæ are known:—*D. balicassius*, type of the genus *Dicrurus*; *D. mirabilis*, its representative form; and *D. striatus*. This last, by its even, almost unfurcated tail, resembles *D. balicassius* in structure, but in its general colouring and in the distribution of its markings exhibits a close relationship to the Papuan and Malaccan species associated by Mr. Sharpe with *Chibia hottentotta*. These Papuan species seemed to me to belong to a group distinct from that represented by *D. balicassius* on the one hand and *Chibia hottentotta* on the other; and their geographical range favoured this view[2]. But Mr. Everett has discovered in Palawan a species which undoubtedly belongs to the Papuan section of the Dicruridæ; and it would appear that, with *D. striatus* as a connecting link, the Papuan and the Philippine species must be regarded as members of one section of the family, to which the title of *Dicrurus* should be applied. Besides this undescribed species, Palawan is inhabited by at least one other member of the family, belonging to the genus *Buchanga*; and Palawan and Lombock are the only two islands or areas known to me where there is a second species associated with a true species of *Dicrurus*, unless,

[1] The type was from Balabac; but the Palawan bird does not appear to differ.

[2] Count T. Salvadori has recently (*antea*, p. 88, note) proposed the generic title of *Dicruropsis* for this group.

indeed, *D. læmostictus* is shown to also inhabit New Ireland or *D. megarhynchus* New Britain.

Male and female. Upper surface of wings and tail burnished bronze-green. Glistening scale-like feathers on crown of head bluish metallic green. Neck-hackles and pectoral and gular spots dark metallic steel-blue; these spots, which extend from lower part of the throat and cover the breast, are lengthened and ovate in form rather than round, and occupy the tips of the feathers. With their exception, the entire under surface is dull jet-black. The nape, back, and uropygium is black with a blue gloss. The tail is forked for about one inch in depth; and the distance between the extremities of the outer pair of rectrices is nearly three inches: upper tail-coverts tipped with metallic green.

Dimensions:—

	Wing.	Tail.	Tarsus.	Culmen.
	in.	in.	in.	in.
♂ ♀	5·5	5·5	1·0	1·5

[P. Princesa, ♂, November 1877: iris crimson; bill and feet black. ♀, December: iris deep brown.]

All the female birds have the iris noted as being deep brown by Mr. Everett. On the label of one of the males Mr. Everett has written:—"Iris in the living bird deep crimson."

D. palawanensis most nearly resembles *D. leucops*, *D. pectoralis*, and *D. læmostictus*; but, besides being much smaller, the shape and position of the pectoral and gular spots are different, not being so round, but narrower.

13. Buchanga leucophæa.

Dicrurus leucophæus, Vieill. Nouv. Dict. d'Hist. Nat. ix. p. 587.
Buchanga cineracea (Horsf.), Sharpe, *t. c.* p. 324. no. 48.

[P. Princesa, ♂, November 29, 1877: iris crimson; bill and feet black. ♂, December: iris deep rich orange-brown. ♀, December: iris orange-brown.]

14. Cyornis banyumas.

Muscicapa banyumas, Horsf. Tr. L. S. xiii. p. 146.
Muscicapa cantatrix, Tem. Pl. Col. 226.

[P. Princesa, ♂, December 1877: iris chocolate; bill black; legs and feet purplish grey; claws dark grey. ♀, January 1877: iris chocolate; bill black; legs lead-grey.]

The female of this species is well described, but badly figured, by Temminck (*l. c.*).

15. Hypothymis azurea (85).

[P. Princesa, ♀, December 1877: iris deep brown; bill entirely black, interior of gape golden: legs and feet dark blue-grey.]

16. Hirundo javanica.

Hirundo javanica, Sparrm. Mus. Carls. t. 100.

[P. Princesa, ♀, December 7, 1877.]

17. Broderipus palawanensis, n. sp.

[P. Princesa, ♀, January 1878.]

A representative form of *B. acrorhynchus*, but smaller and with a shorter bill. The yellow space included with the black horseshoe-mark on the head extends far beyond the eyes, and measures in depth over one inch. There is no yellow alar spot.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♀....	5·9	4·5	1·0	1·5

18. Oriolus xanthonotus.

Oriolus xanthonotus, Horsf. Tr. L. S. xiii. p. 153; Zool. Res. Java, t. 46; Temm. Pl. Col. 214.

[P. Princesa, ♂, December 30, 1877: iris crimson; bill burnt sienna; legs dark lead-grey.]

In the colouring and markings the single specimen sent by Mr. Everett (an adult male) is not to be distinguished from Malaccan, Bornean, and Sumatran individuals; but it greatly exceeds them by its dimensions—wing 4·63 inches, tail 3·50.

19. Trichostoma rufifrons, n. sp. (Plate XXXVIII.)

Mr. Everett has sent three skins of a Timeliine bird which appear to belong to a somewhat aberrant form of the genus *Trichostoma*. The bill, seen in profile, has the exact contour of the bill of *T. abboti*, but is somewhat stouter; at the base it is slightly broader; and the rictal bristles are longer. The tail is also more graduated, the outer pair of rectrices being shorter than the penultimate pair, which, again, are not quite so long as the remainder. Perhaps this species is congeneric with the two described and figured by Mr. Sharpe (*t. c.*) under the titles of *Zeocephus cinnamomeus* and *Z. cyanescens* (species with which I am unacquainted); but if so, they cannot be classed under the Muscicapidæ.

Male and female. Forehead bright rufous-brown, contrasting with the duller rufous-brown of the vertex and occiput. Nape and back earthy brown, tinged with olive and paler on the nape. Long, lax feathers of the uropygium bright rufous. Upper tail-coverts pure chestnut; rectrices dull chestnut. Lores and supercilium, which extends behind the eye, pure grey. Cheeks and ear-coverts greyish brown. Chin, throat, and vent pure white. Breast, abdomen, flanks, under tail-coverts, and under wing-coverts tawny, with a pale brown shade on the breast. Primaries brown, edged with pale tawny chestnut. Remaining quills and the wing-coverts dull chestnut, tinged with the colouring of the back.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂....	3·37	3·50	1·00	0·94
♀....	3·12	3·25	0·95	0·87

[P. Princesa, ♂ ♀, December 10, 1877: iris pale Naples-yellow; dill dark plumbeous; feet pale plumbeous.]

20. Drymocataphus cinereiceps, n. sp.

This species is congeneric with *Brachypteryx malaccensis*, Hartl., which Count T. Salvadori retains under the genus *Brachypteryx*. But *B. malaccensis* is certainly nearer to *Drymocataphus* than to *Brachypteryx*, although it may perhaps be advisable to form a separate genus for its reception, more especially as the species which inhabits Palawan, about to be described, is identical in structure with the Malaccan and Bornean form (which is also said to inhabit Sumatra), and also as *Brachypteryx murinus* is congeneric.

Female. Forehead, crown, and occiput dark iron-grey. Ear-coverts, space before the eye, and nape pale grey. Back, uropygium, scapulars, upper tail-coverts, and exposed surface of wing and tail ruddy brown, brighter than in *D. malaccensis*. Dorsal plumes pale-shafted. Chin, throat, upper breast, abdomen, and vent pure white. Flanks, a band across the breast, under tail-coverts, and thigh-coverts, wing-lining, and axillaries pale rufous-brown.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♀....	2·50	1·00	1·06	0·75

[P. Princesa, ♀, January 1878: iris burnt sienna-orange; bill brownish grey, mandible white; legs pallid, the front of tarsus tinged brown.]

Distinguished from *D. malaccensis* by its dark-grey head, its light-grey ear-coverts, and the brighter rufous of the dorsal plumage.

21. Mixornis woodi.

Mixornis woodi, Sharpe, *t. c.* p. 331. no. 69.

[P. Princesa, ♂, December 5, 1877: iris dark ochre-yellow; bill black, mandible grey; legs and feet horn-yellow. ♀, January 1878: iris ochreous orange; bill dark grey, mandible pale grey; legs greenish olive.]

22. Brachypus cinereifrons, n. sp.

Male and female. Chin, throat, and breast pale cinereous brown, palest and whitest on the chin and throat. Abdomen and ventral region pale yellowish white, in some examples with a certain admixture of the colouring of the breast. Flanks pale earthy-brown. Thigh-coverts ochreous yellow. Under tail-coverts light yellow, with a slight ochreous tinge. Wing-lining and axillaries pale yellow; carpal edge ochreous yellow. Ear-coverts pale cinereous, with almost white shafts. Space before the eye uniform dull brown. Cheeks dull cinereous brown, with a few white-shafted feathers. Head and nape olive-brown, tinged with pale grey, the frontal feathers being distinctly tipped and centred with pale grey. Back, scapulars, wing-coverts, and uropygium olive-brown, olive predomi-

nating, the long, lax, and fluffy uropygial feathers being of a slightly lighter shade of olive-green. Upper tail-coverts olive-green. Quills light brown, margined with a brighter olive-green. Rectrices light brown, edged with olive-green, and some with pallid yellowish apices. Underneath pale brown, washed with very light yellowish green. Shafts above brown, below yellowish white.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂....	3·37	3·37	0·88	0·88
♀....	3·25	3·12	0·87	0·75

[P. Princesa, ♂, December 14, 1877: iris deep rich burnt-sienna: bill blackish brown; legs and feet purple-brown. ♂, November 28: iris chocolate; bill dark brown; legs pale brown.]

One example marked ♀ equals the ♂ in its dimensions.

Mr. Everett procured a good series of this short-footed Thrush. At first sight it can be easily mistaken for *B. plumosus* (Blyth), of which it is a representative form. It is to be distinguished by its pale abdomen, which in *B. plumosus* is browner and nearly uniform with the breast, by its pale greyish breast, by its yellow under tail-coverts, which in *B. plumosus* are ochreous-brown, by its pale yellow, and not ochreous, wing-lining and axillaries, and by the cinereous or pearl-grey edgings and centres of the frontal plumes. Nor is the green of the quills and rectrices nearly so developed. The colouring of the abdominal plumage resembles that of *Iole olivacea*, but is not so distinctly yellow.

23. Brachypodius melanocephalus.

Lanius melanocephalus, Gm. S. N. i. p. 309.

[P. Princesa, ♂ ♀, January 1878: iris violet-blue; bill and legs black.]

Undistinguishable from typical examples.

24. Criniger frater.

Criniger frater, Sharpe, *t. c.* p. 334. no. 77.

[P. Princesa, ♂, December 1, 1877: iris red-brown; bill horn-grey, darker on culmen. ♀, December: iris red-brown; bill dark grey; mandible whitish; legs, feet, and nails pallid brown.]

25. Criniger palawanensis, n. sp.

Male and female. Chin, lower breast, abdomen, vent, under tail-coverts, wing-lining, axillaries, and carpal edge bright yellow. Feathers of the throat, cheeks, and upper breast of the same yellow, the centres towards the apices being pale grey. These parts have thus a streaked appearance. Sides of the breast and the flanks clouded with pale brown; a few of the nareal plumes bright yellow. Space before the eye yellowish grey. Head, ear-coverts, and nape reddish brown, the frontal and coronal plumes being sublanceolate and with pale central streaks. Back, scapulars, wing-coverts, and uropygium

ruddy olive-brown. Upper tail-coverts, which are almost concealed by the mass of loose and lax uropygial plumes, ruddy brown. Rectrices of a darker tone than the tail-coverts. Quills brown, margined with the colour of the dorsal plumage.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂ ♀	3·25	3·20	0·75	0·87

[P. Princesa, ♂, January 1878: iris lemon-yellow. ♀, December 27, 1877: iris lemon-yellow; bill dark smoky grey, the mandible whitish; legs and claws pale brown.]

26. PHYLLORNIS PALAWANENSIS.

Phyllornis palawanensis, Sharpe, *t. c.* p. 333. no. 72, t. 50. f. 1, 2.

[P. Princesa, ♂ ♀, January 1878.]

The only example marked ♀ has the terminal portions of the moustache deep blue. Two examples marked ♂ have it white. Mr. Sharpe's conclusions (*l. c.*) on the point were the reverse. This is one of the most beautiful species of the genus. The throat is bright golden; and the whole colouring of Mr. Keuleman's figures (*l. c.*) is much too pallid.

27. ÆGITHINA SCAPULARIS.

Iora scapularis, Horsf. Tr. L. S. xiii. p. 158.

[P. Princesa, ♂ ♀, December 12, 1877: iris white; bill lead-grey, the culmen black; legs and feet bluish grey; claws black.]

All the males are without a trace of black on the upper parts. They agree with Bornean and Malaccan examples (*I. viridis*, Bp.?). Bornean individuals are stated by Count T. Salvadori to be identical with Javan (Ucc. Borneo, p. 191).

28. MONTICOLA SOLITARIUS (103).

[P. Princesa, ♂ ♀, December 1877.]

29. CITTOCINCLA NIGRA.

Cittocincla nigra, Sharpe, *t. c.* p. 335. no. 82, t. lii. f. 1, 2.

[P. Princesa, ♂, December 14, 1877: iris very dark brown; bill, legs, and feet black. ♀, January 1878: iris dark brown; bill black; legs lead-grey.]

30. ORTHOTOMUS RUFICEPS.

Edela ruficeps, Lesson, Tr. d'Orn. p. 309.

[P. Princesa, ♂ ♀, December 1877.]

31. ANTHUS MACULATUS.

Anthus maculatus, Hodgs. Gray's Zool. Misc. p. 83; Tweeddale, P. Z. S. 1877, p. 596. no. 48.

[P. Princesa, ♀, January 2, 1878.]

32. Myzanthe pygmæa (121).

[P. Princesa, ♂, January 7, 1877: iris dark brown; bill and legs black.]

33. Nectarophila sperata (122).

[P. Princesa, ♂, January 1878. ♀, December 29, 1878: iris warm brown.]

Two males, not adult; the violet throat and plastron bounded on both sides with a white border, the scarlet breast mixed with white, the crown dingy dull brown.

34. Cyrtostomus aurora, n. sp.

Notwithstanding that Captain Shelley, in his beautiful work on the Sun-birds, includes the large group of Asiatic and Australian Nectariniidæ, of which *C. jugularis* and *C. asiaticus* may be taken as types, along with a number of other species, under Cuvier's genus *Cinnyris*, I still adhere to the view expressed by me (Ibis, 1870, p. 19) that these Sun-birds form a natural, distinctive, and separate section of the family. For it I adopted Dr. Cabanis's generic title *Arachnechthra*; but as the type of that genus is *C. lotenia*, L., which may be considered generically separable (although not so in my opinion), and as Dr. Cabanis established his genus *Cyrtostomus* (type *C. jugularis*, L.) before that of *Arachnechthra*, according to strict rule, the generic title of *Cyrtostomus* should be employed; and I observe that this is the view of Count Salvadori. There are now twelve species of this group described—namely, *C. asiaticus*, *C. lotenia*, *C. osea*, *C. brevirostris*, *C. flammaxillaris*, *C. andamanicus*, *C. rhizophoræ*, *C. pectoralis*, *C. frenatus*, *C. jugularis*, *C. zenobia*, and *C. solaris*. To this list Mr. Everett's researches in Palawan enable me to add a thirteenth.

Male. Above uniform dark olive-green. Forehead, chin, throat, cheeks, and upper breast metallic steel-blue with shades of green and violet in certain lights. Lower breast fiery orange-red. Remainder of lower surface, under tail-coverts, and wing-lining bright yellow. Quills brown, faintly edged with olive-green. Rectrices black; terminal half of outer pair white, a broad white terminal patch on the penultimate pair; apices of third pair fringed with white, of fourth pair still less so.

Female. Above and ear-coverts olive-green, slightly lighter in shade than that of male. Superciliaries, cheeks, and all the under surface and the wing-lining bright yellow. Wing-feathers brown, margined with olive-green. Rectrices as in male.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	2·25	1·62	0·62	1·00
♀	2·00	1·62	0·60	0·87

[P. Princesa, ♂, November 30, 1877: iris deep crimson; bill and legs black. ♀, Jannary: iris dark brown; bill and legs black.]

The flame-coloured lower breast at once distinguishes this Sunbird from all others. Its nearest ally is *C. solaris*, in which the flame-colour covers the abdomen also.

35. CHALCOSTETHA INSIGNIS.

Nectarinia insignis, Jardine, Nat. Lib. xxxvi. p. 274.

[P. Princesa, ♂, January 1878: iris warm brown; bill and legs black.]

A single example of an adult male, and not to be distinguished from Sumatran and Malaccan individuals.

36. ÆTHOPYGA SHELLEYI.

Æthopyga shelleyi, Sharpe, Nature, 3rd August, 1876, p. 297; Tr. L. S. 2nd ser. Zool. i. p. 343. no. 105; Shelley, Monogr. Cinnyridæ, pt. iii. t.

[P. Princesa, ♂, December 2, 1877: iris brown; bill black; legs and feet very dark brown. ♀ (?), January 4, 1877: bill and legs dark brown.]

The female has not been described; and it is with some doubt that I so identify the single skin noted above. The chin, throat, and upper breast is pale grey; the lower breast and abdomen and wing-lining are pale yellowish white. The vent and under tail-coverts of a more decided shade of yellow. The head is greyish olive-brown. Remainder of upper surface a clear olive-green, lightest on the upper tail-coverts. The quills and rectrices are dark brown edged with olive-green, having a slight ruddy hue. Cheeks and ear-coverts pale grey with a greenish tinge. The dimensions are sensibly smaller than those of the male—wing 1·75; culmen 0·56.

37. ANTHREPTES MALACCENSIS.

Certhia malaccensis, Scopoli, Del. Flor. et Faun. Insubr. ii. p. 91. no. 62.

[P. Princesa, ♂, January 1878: iris Indian red; bill black; legs greyish olive; scales of feet yellow. ♀, December 29, 1877: iris bright Indian red; bill very dark sepia-brown; legs and feet yellowish olive; soles of feet yellow; claws pale brown. ♂ (jun.), November 27, 1877: iris Indian red; bill dark brown; legs yellowish olive.]

The example of the young male above noted is in the exact plumage of the adult female, its sex being betrayed by a couple of metallic plumes on the crown.

38. ARACHNOTHERA DILUTIOR.

Arachnothera dilutior, Sharpe, Nature, 3rd August, 1876, p. 297; *t. c.* p. 341. no. 100; Shelley, Cinnyridæ, pt. iii. t.

[P. Princesa, ♂, December 6, 1877: iris brown; bill black; legs and feet dark grey. ♀, January 1878: iris dark brown; denuded orbital skin green-yellow; bill black; mandible grey; legs and feet blue-grey.]

Bill of female considerably shorter than that of male.

39. Corvus pusillus, n. sp.

Female. Basal portion of plumage white. Above purple-black, with a slight greyish shade. Wing-coverts and outer margins of rectrices deep purple-black. Plumage underneath dull ashy black, with a purplish gloss on cheeks and throat. Contour of bill as in the *C. validus* group.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♀	8·75	5·25	1·75	2·12

[P. Princesa, ♀, December 27, 1877: iris deep brown; bill, legs, and claws shining black.]

This Crow, or rather small Raven, is a diminutive form of *C. validus* and its allies. It has no affinity with true *C. enca*.

40. Calornis panayensis (128).

Calornis chalybeus (Horsf.), Sharpe, *t. c.* p. 343. no. 111.

[P. Princesa, ♀, December 1877: iris brilliant red; bill and feet black.]

A large series is sent by Mr. Everett, which I refer to the Philippine rather than to the Bornean species.

41. Gracula javanensis.

Corvus javanensis, Osbeck, Voy. China & E. Ind. i. p. 157, "Java" (Eng. tr. 1771).

[P. Princesa, ♂, January 1878: iris deep brown; bill fine deep orange; wattles and legs chrome-yellow; claws dark brown. ♀, December 3, 1877: iris deep brown; bill red-orange; wattles orange-yellow; legs yellow.]

These examples are not to be distinguished from Bornean, although they are somewhat smaller and have slenderer bills than Javan and Sumatran individuals.

42. Oxycerca everetti.

Oxycerca everetti, Tweeddale, P. Z. S. 1877, p. 699, t. lxxiii. f. 2.

[P. Princesa, ♂, December 1877: iris rich deep orange-brown; bill, maxilla black, mandible pale grey; feet, legs, and claws dark lead-grey. ♂ juv.: iris umber-brown; mandible blackish; maxilla black; angle of gape pure white; legs, feet, and claws lead-grey.]

Oxycerca everetti is a very closely allied form of *O. leucogastra* of Malacca and Borneo, mainly to be distinguished by the crown of the head being striated in the former and uniform in the latter, and the breast and general colouring being nutmeg-brown and not sooty brown. These Palawan examples, although not quite identical with either species, most nearly resemble *O. everetti*. The general tone of colour is nutmeg-brown; but the crown of the head is not striated.

43. Osmotreron vernans (135).

[P. Princesa, ♀, January 2, 1878: iris (in dead bird) orange; bill lead-grey, base yellow-olive; feet carmine; claws grey.]

44. Treron nasica.

Treron nasica, Schlegel, Ned. Tijdschr. Dierk. i. p. 67.

[P. Princesa, ♂ ♀, January 1878: iris deep brown, with outer ring of burnt sienna-orange; orbital skin bright emerald-green; base of bill dull crimson, the rest pale greenish-yellow; feet carmine.]

45. Carpophaga ænea (141).

[P. Princesa, ♂, January 1878: iris pure crimson; bill bluish grey; feet violet-carmine; nails dark grey. ♀, December 28, 1877: iris deep crimson; orbital ring crimson; bill light grey; feet carmine; nails dark grey.]

46. Polyplectron emphanes.

Polypectron emphanum, Temm. Pl. Col. 540; Elliot, Phasianidæ, vol. i. pl. 9.

[P. Princesa, ♂, January 1878: iris dark rich brown; orbital and loral regions crimson; bare setigerous skin above the eye livid brown; bill, including vaulted base of maxilla, very dark brown, tip horny; legs, feet, and nails purple-brown.

Native name "Tandikan."

♀ juv.: orbital skin black, otherwise not different from the male.]

The male of this beautiful Pheasant was first described and figured by Temminck on the 14th of May, 1831, from a single example in the museum of the Prince of Essling (*l. c.*). Its habitat was unknown, but was believed to be either one of the Sunda Islands or else one of the Moluccas. In the same year, but earlier, Lesson (Tr. p. 437) enumerated the species under number 47 of the genus *Polyplectron*, and called it *P. napoleonis*; but as he gave no description, his title falls.

A second specimen of the species was afterwards acquired from Messrs. Verreaux by the British Museum; but the habitat still remained unknown, the late Mr. G. R. Gray giving it as the Moluccas (List Birds B. Mus., Gallinæ, 1867, p. 25). Mr. Sclater (P. Z. S. 1863, p. 124) attributed its habitat, with some doubt, to the island of Borneo, in which he was followed by Mr. Elliot (*l. c.*). Mr. Everett has now cleared up all doubts; for he has found this Pheasant living in the island of Palawan near the Spanish settlement of Puerto Princesa, and has sent me three examples—one of the adult male, one of the immature female, and one of an immature male.

This is the second instance in which Mr. Everett has established the correct habitat of a little-known and remarkable bird.

The young male has the lengthened crest-plumes brown, partially tinged with green. The brilliant bluish-purple wing-coverts and interscapulars of the fully adult are absent, only a trace presenting itself on one covert of each wing. Whereas in the adult the nape and neck are black with brilliant green borders to the feathers, and

the whole throat and breast are black with green reflexions, the immature bird is brown. The quills and underparts are also very dark brown in the adult, whereas in the immature bird they are light brown. The ocelli on the rectrices in the immature bird are not so perfectly formed, and the dark brown ground-colour of the dorsal plumage and of the rectrices is not so well defined.

The skin of the female (immature) has the chin, space before the eye, and throat dingy white. The green ocelli only occur on some of the rectrices, and are small. The remainder of the plumage resembles that of the young male, the crest being shorter and uniform brown.

47. MEGAPODIUS CUMINGII.

Megapodius cumingii, Dillwyn, P. Z. S. 1851, p. 118, t. 39.

[P. Princesa, ♂, January 1878: iris warm brown; orbital skin coral; auricular region washed with bright red; bill horn-yellow; legs reddish, brighter than in female; tarsal scutellæ and feet dark olivaceous brown; the red of the face brighter than in female. ♂ juv., January 1878: character of soft parts as in mature male, only paler. ♀, January 2, 1878: iris warm brown; bill horn-yellow; orbital skin coral; auricular region washed with vermilion-red (not crimson); legs yellowish grey, the tarsal scutellæ dark grey.

Note.—In these birds the bill is sometimes horn-yellow, sometimes the same more or less deeply tinged with brown on culmen and at the base. "Tabun" of the natives.]

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	9·00	3·50	2·50	1·25
♀	9·25	3·50	2·50	1·18

The Palawan megapode closely resembles the Labuan (*M. cumingii*), and can hardly be separated specifically. In this view Mr. Sharpe concurs.

48. EUDROMIAS GEOFFROYI (161).

[P. Princesa, ♂, November 29, 1877.]

49. ÆGIALITES CANTIANUS.

Charadrius cantianus, Lath. Suppl. Ind. Orn. p. lxvi.

[P. Princesa, ♀, November 29, 1877.]

50. TRINGOIDES HYPOLEUCUS (183).

[P. Princesa, ♀, December 11, 1877.]

51. BUBULCUS COROMANDUS (194).

[P. Princesa, ♂ ♀, December 1877.]
Forehead in both examples buffy yellow.

52. BUTORIDES JAVANICA (197).

[P. Princesa, ♀ juv., January 6, 1878.]

7. On the Trachea of *Tantalus loculator* and of *Vanellus cayennensis*. By A. H. Garrod, M.A., F.R.S.

[Received May 21, 1878.]

In his 'Beiträge zur Naturgeschichte von Brasilien,' Maximilian, Prince of Wied[1], describes briefly and figures the lower end of the trachea of *Tantalus loculator*. A male specimen of the species having recently died in the Society's Gardens, I take the opportunity of more minutely pointing out its peculiarities and of comparing it with *T. ibis*, the windpipe of which, with its elaborate convolutions, I have had the opportunity of bringing before the notice of the Society upon a previous occasion[2].

In *Tantalus loculator* the trachea is not elongated as it is in *T. ibis*; nevertheless it is peculiarly modified, and differs in detail from that of any bird with which I am acquainted, although its plan of construction is perfectly Ciconiine.

The seventy-eight lowermost rings of the trachea are those which are modified, the rings above them being quite typical, of average depth, notched in front as well as behind, and overlapped to produce the well-known zigzag markings on the surface.

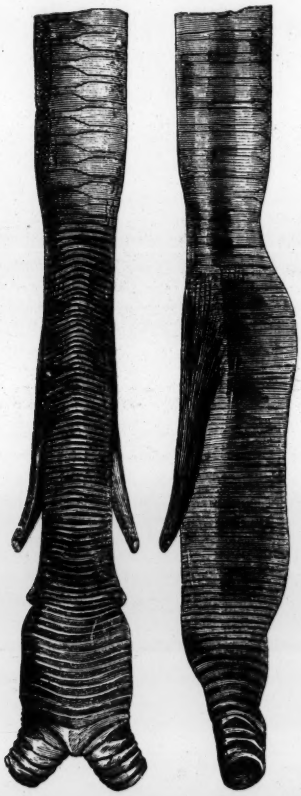
With the exception of the last one, all the modified rings are much reduced in depth; and of them the sixty-one upper rings are compressed from side to side and bent sharply in front, whilst the lower seventeen are somewhat flattened from before backwards and sharply bent laterally, the general effect of which is to produce a lateral flattening and an anterior carination of the whole tube opposite the fifty-one rings, as well as an antero-posterior flattening with a lateral carination in the part below. The change from the superior unmodified tube to the laterally compressed portion is somewhat abrupt, as is that between the two differently modified parts. In figure 1 *a* (p. 626) the front view of the lower end of the trachea is represented, figure *b* giving a side view of the same.

The powerful sterno-tracheal muscles leave the wind-pipe opposite the middle of the laterally flattened portion of the tube; and a few muscular fibres from their anterior margin are continued downwards for a short distance, but not nearly to the last ring, they being lost upon the sides of the trachea.

The arrangement above described is only an exaggeration of what is found in *Ciconia alba*, in which species the lowermost nine-and-twenty tracheal rings are extremely shallow and slender, the fifteen above the bifurcation of the bronchi being antero-posteriorly flattened, the fourteen above them being in no wise peculiar except for their slenderness. In *C. alba* there is, however, a small prolongation upwards of the lateral portions of the three lowermost tracheal rings, which forms a consolidated triangular process on each side, overlapping the next few rings, and looking extremely like rudiments of the

[1] Band iv. p. 687, tab. 1. figs 7 and 8.
[2] P. Z. S. 1875, p. 298.

Fig. 1.



a *b*

Lower end of the trachea of *Tantalus loculator* ♂.
a. View from the front; *b*. View from the right side.

similarly situated *processus vocales* of the passerine tracheophone syrinx, which resemblance is increased by the thinness of the neighbouring rings and their being flattened from before backwards.

In *Tantalus loculator* there is no trace of these triangular processes. Its last tracheal ring, or three-way piece, is not enlarged, as it is in so many birds; and the rings of the bronchi for some considerable distance are complete as in the Ciconiidæ generally, which is so very seldom found to be the case in the Class. In this last feature the Storks agree with the Cathartidæ, and the general arrangement of the bifurcation of the Stork's windpipe would require but little change to pass into a Cathartine type.

The uppermost bronchial rings are thinner on the outer side of each bronchus than they are internally, which consequently leaves greater gaps between them along the outer margin of the tubes. Ring four on one side and ring three on the other are partly reduplicated, the extra processes ending freely in the bronchial membrane.

From this description it is evident that these two *Tantali* differ greatly in the arrangement of their windpipes, whilst a recent comparison of specimens makes it evident to me that what I thought on seeing *T. loculator* might have been an error in my account of *T. ibis*, namely the *posterior* carination of the windpipe, is correct, in which, as well as in the relative lengths of trachea, the two species differ so much.

In other anatomical characters *Tantalus loculator* agrees with *T. ibis*, and is perfectly ciconiiform. In both the great pectoralis muscle is formed of two layers, as in the Steganopodes, Procellariidæ, and Cathartidæ only. The ambiens muscle is slender; the femorocaudal is minute, without any accessorius; and the semitendinosus, as well as its accessorius, are not large. There is no great gluteus muscle, nor any muscular slip from the biceps of the wing running to the patagium.

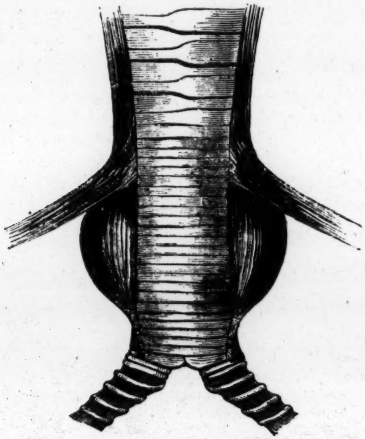
The small intestine measures six and a half feet, the cæca half an inch, and the large intestine nearly three inches. The stomach is capacious, with but a small muscular development. The tongue is an inch long and arrow-head shaped. The sub-equilobed liver has a gall-bladder.

In *Vanellus cayennensis* there is an exaggerated development of the intrinsic muscles of the trachea a short way above its bifurcation in both sexes that is quite worthy of special note, because the amount of muscular fibre there present is proportionately as much as in any bird with which I am acquainted.

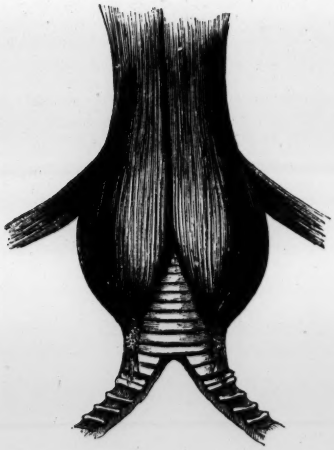
There is nothing peculiar about the windpipe itself or the bronchi, which are represented in the accompanying figure (p. 628). The uppermost two bronchial semirings are not like those which succeed them, but are like halves of tracheal rings. The third and fourth semirings are closely united, whilst those which follow are not modified in any way.

The sterno-tracheal muscles are powerful, and besides springing directly from the side walls of the windpipe opposite the spot where

Fig. 2.



a.



b.

Windpipe of *Vanella cayennensis*.
a. Anterior aspect; *b*. Posterior aspect.

they run off, their upper fibres are continuous up the trachea itself in front of and in contact with the intrinsic muscles. These latter, one on each side as usual, meet in the posterior middle line of the trachea, but are not unusually near in front; they are of considerable size throughout. Near their lower ends they increase immensely in bulk to form, combined posteriorly, a large subglobose mass which is situated opposite the twenty-four lowermost rings of the trachea, which are considerably shallower than those above them and consequently occupy a much less space than if they were of the same depth, as is the case in *Tantalus loculator*. There is a consolidation of the last few rings in adult birds, with which the first two bronchial semirings fuse to form a compound three-way piece, and it is to the lower elements of this that the powerful lateral muscles are attached (as well as to the third and fourth bronchial semirings slightly) by a broad fibro-tendinous continuation of their muscular substance, which fixes itself on each side along nearly the whole length of the semirings, especially the second, of which the extremities are alone free.

So far as I can find out by watching the living birds, there is nothing peculiar in their note to lead one to surmise so large a muscular supply for their lower larynx. They make a powerful screech, with no modulation in it; and it can hardly be possible that the extra muscular development has not some other function to perform. What that may be it is not easy to surmise.

8. On the Anatomy of the Maleo (*Megacephalon maleo*).

By A. H. Garrod, M.A., F.R.S.

[Received May 21, 1878.]

Besides being a Megapode, *Megacephalon maleo* is interesting as a peculiar form; I therefore take the opportunity of bringing before the Society the results of my dissection of three specimens of this bird which have died in the Gardens.

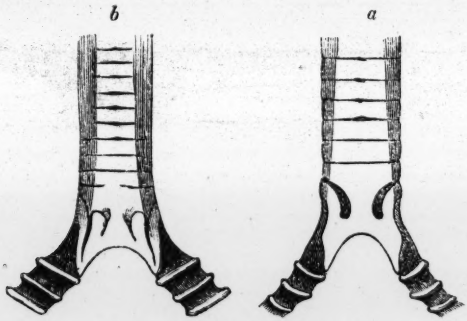
Pterylosis.—In the distribution of its feather-tracts the Maleo is somewhat different from the typical Gallinæ. Nitzsch briefly records what he found in a bad specimen of *Megapodius rubripes*, mentioning that the tracts were not different from those in allied birds, and that the oil-gland was tufted. This is all we know of the pterylosis of the group.

In *Megacephalon maleo* the anterior surface of the neck is covered, not thickly, with feathers, which only tend to divide opposite the furcula into the two pectoral tracts, each of which descends, strong and uniform in breadth, to opposite the middle of the carina sterni, where it ceases obtusely. The ventral tract does not exist over the anterior or upper part of the pectoral region, but commences narrow close to and opposite the middle of the carina sterni, dilating opposite the abdomen, near the middle line of which it descends parallel to its fellow, to just above the anus, where the two meet. The skin over the carina and in the middle line of the abdomen is hard and

scaly. The hypopteral tract is but feebly represented, and the termination of the pectoral tract is some distance from the commencement of the abdominal tract, the angle between the direction of the one and the other being about 25°.

A strong tract traverses the middle dorsal line of the neck, with a space on each side of it. This does not bifurcate in the scapular region, but ceases abruptly a little below the level of the shoulder-joints, undilated. Over the rump and the inferior scapular region the dorsal tract is diffused and indefinite, ceasing before the *nude* oil-gland is reached. There is no ephippial space. There are sixteen rectrices. The lumbar tract is only well developed over the tibia-head and for a little way behind it. The humeral tract is not in any way peculiar. I counted nine primary and sixteen secondary remiges, the first and second secondary feathers being considerably shorter than those which follow.

Down-feathers are generally distributed. The after-shaft is weak, and the rhachis of each feather is not swollen, except in some of the smallest size.



Lower larynx of *Megalocephalon maleo*.
a. From the front; *b*. From behind.

Visceral Anatomy.—The tongue is simple and fleshy; a well-developed crop is present, situated between the limbs of the very open furcula; the proventriculus is zonary, the gizzard powerful; the small intestine is four and a half feet long, the simple cæca five and a half inches, and the large intestine five inches in length.

There is only one carotid artery, the left, as in all the Megapodiidæ.

In its *myology* the bird is perfectly gallinaceous, the third pectoral muscle being found beneath the much larger second of the same name, the femoro-caudal and semitendinosus with their accessories, the ambiens, gluteus maximus, being all present. The obturator internus is triangular; a vinculum joins the two deep flexors of the foot, and the biceps of the arm sends a fasciculus to the patagium. The expansor secundariorum muscle ends by running to the scapula at the same time that it sends a slip of tendon to the first rib.

The lower end of the trachea is represented in the accompanying figures (p. 630), from the front and from behind. It differs in arrangement from all other of the Gallinæ with which I am acquainted. To the terminal tracheal three-way ring is fused the first bronchial semiring by its extremities, its bowed free portion being upturned with its limbs almost perpendicular. In the middle line posteriorly the penultimate tracheal ring fuses with the what may be compound three-way piece, in the posterior aspect of which a small upward-directed tongue of cartilage develops from its upper border. The sterno-tracheal muscles are minute and the intrinsic tracheal muscles form thin broad sheets which almost cover the tube and end on the outer surface of the first bronchial semiring and in the semicartilaginous large membrane between it and the unmodified following semiring.

June 4, 1878.

Prof. Flower, F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1878 :—

The total number of registered additions to the Society's Menagerie during the month of May 1878 was 104, of which 43 were by birth, 39 by presentation, 8 by purchase, 7 by exchange, and 7 were received on deposit. The total number of departures during the same period by death and removals was 120.

The most noticeable additions during the month of May were as follows :—

1. Two male Lesser Birds of Paradise (*Paradisea minor*), purchased of Mr. Leon Laglaize, May 2. On his return from the Eastern Archipelago in October last, Mr. Laglaize brought with him four living specimens of this Paradise-bird. All of these passed the winter safely in the Jardin des Plantes at Paris ; and two of them in full plumage have now been acquired by the Society.

The only other examples of Paradise-bird previously living in the Society's Gardens were the two individuals of the same species brought by Mr. Wallace from Singapore in April 1862[1]. One of these lived until 25th December, 1863, the other until the 28th March, 1864, in the Society's Gardens.

2. A Copper-head Snake (*Cenchris contortrix*) presented by Dr. Frederick Painter, F.Z.S., of South Pittsburg, Tennessee, U. S. A. This is a well-known venomous snake in the United States ; but we have not previously received living examples of it.

3. A Hairy or Andean Tapir (*Tapirus roulini*[2]), obtained in exchange from Mr. C. Rice, May 25.

Although we have had in our Gardens examples of all the other three known species of Tapirs, this is, I believe, the first example

[1] See P. Z. S. 1862, p. 123.

[2] See, for the reasons for adopting this name, footnote, P. Z. S. 1870, p. 51.

of this rare and little-known animal that has been seen alive in Europe[1].

Mr. Wolf's sketch (Plate XXXIX.) will give a good idea of the external appearance of the present specimen, which is a young male, probably not full-grown, and with the teeth small and imperfectly developed. The hairs over the whole body are nearly uniformly thick, but short; they are barely an inch in length, and of nearly uniform black colour throughout, with just a shade of brown tinge. The hairs on the nape of the neck and sides of the body are rather longer; those on the sides of the face are brown, and there is a slight white spot at the corner of the mouth, and some white hairs at the extremity of the muzzle. There is a slight white external edging to both ears. There are no white rings round the feet; but the upper margins of the naked nails have a whitish appearance. The irides are of a light bluish hazel, quite different from those of the ordinary *Tapirus terrestris*, in which they are brown.

The height of the animal at the shoulders is about 26 inches; the length from the end of the extended snout to the base of the tail about 54 inches.

There can be no question, to my mind, that Dr. Gray's *Tapirus leucogenys* (P. Z. S. 1872, p. 483) is merely an individual variety of the present species. The figure given (*l. c.* pl. xxi.) is altogether of too brown a tinge; and in Dr. Gray's specimen itself, which is now in the British Museum, the general colour is darker and more of a greyish black, and, except as regards the white sides of the jaws and grey face, does not materially differ from that of our specimen. As regards the white cheeks, upon which Dr. Gray lays so much stress, it may be remarked that M. Roulin's "*Tapir pinchaque*" had traces of the same colour[2], and there are likewise traces of it in our living specimen.

The Secretary exhibited a young specimen of Temminck's Manis (*Manis temmincki*), which had been brought from Zanzibar by Mr. Frederick Holmwood, Assistant Political Agent at Zanzibar, and read the subjoined extract from a letter of Mr. Holmwood referring to it:—

"The mother of this little Pangolin came from the coast opposite Zanzibar, lat. 6° S.; but I have seen what I took to be the same animal, both in Somali-land under the equator and as far south as the Makna country opposite Mozambique. They always appeared to burrow in hard or stony ground; and I saw them always in the daytime.

"The mother of the specimen I send you lived three months in Zanzibar. She only fed at night, and remained coiled up in a ball all day. She regularly retired to the dark corner of my harness-room at daylight, and left for the garden at sunset. There were very few ants; but she seemed to get plenty of insects. She bur-

[1] Unless it be true, as stated in Mr. Jamrach's letter to 'The Times' of May 31st, that an example of the same animal has lately been acquired by the Zoological Gardens of Antwerp.

[2] *Vide* Ann. des Sci. Nat. xvii. p. 109.



Kendart imp.

TAPIRUS ROULINI

rowed at intervals all round the garden-walls; but this was evidently only to try and escape, as she never made a hole large enough to give cover. The day she had the young one she came out during the day; but not being quite up to grubbing for insects, she went into the stable and remained among the horses grubbing in the dung. After the birth she tried to entice the young Pangolin to suck (apparently), sitting up like a dog when begging, and coiling up the moment she got it in her lap. I could not, however, detect whether she managed to suckle it; indeed I was quite ignorant of the habits of the animal in its natural state. The first day the young one had soft scales; but they hardened the second day, and it died the same night. The mother wandered about for two days afterwards, then came into the house and died."

Mr. Sclater stated that he had, in company with the Superintendent, examined the living examples of *Ciconia maguari* now in the Society's Gardens, and could confirm what Mr. Ridgway had so clearly described (Bull. U.S. Geol. Surv. vol. iv. p. 250) as to extraordinary mimicry of the true rectrices by the elongated upper tail-coverts. The same was also the case with *Ciconia episcopus*, of which there were also living examples in the Society's Gardens.

Mr. Ridgway's generic term *Euxenura*, however, based on this peculiar structure, had, it appeared, been anticipated by Dr. Cabanis, who, in 1850, had proposed the name *Dissoura*[1] for this form of Stork; so that the two species should stand for the future as *Dissura maguari* (Gm.) and *D. episcopus* (Bodd.).

On behalf of Dr. Elliott Coues, C.M.Z.S., two specimens of *Synaptomys cooperi*, Bd., were exhibited by Mr. Edward R. Alston. This species, Mr. Alston observed, was the type of *Synaptomys*, proposed in 1857 by Prof. Baird as a subgenus of *Myodes*[2], and accorded full generic rank by Dr. Coues in 1874[3]. The present specimens were, as far as was known, the first typical specimens sent to Europe. When Mr. Alston wrote his paper "On the Classification of the Order Glires"[4] he was only acquainted with Dr. Coues's preliminary remarks, and hesitated at accepting the full generic value of this form; he was therefore now desirous of expressing his full recognition of its rank. *Synaptomys* was particularly interesting as presenting a connecting link between the Lemmings and Field-Voles, combining the general cranial and dental characters of *Myodes* with the external peculiarities of *Arvicola*, but differing from both in its grooved upper incisors. Its range was much less boreal than that of the Lemmings, extending as far south as Kansas. The specimens exhibited were destined for the British and Berlin Museums.

[1] *Cf.* Reichenow, J. f. Orn. 1877, p. 168. The name is written *Dissoura*; but *Dissura* is more simple and more correct.
[2] Mamm. N. Amer. pp. xliv, 558.
[3] P. Ac. Philad. 1874, p. 192. *Cf.* Mon. N. Am. Rodent. p. 223.
[4] P. Z. S. 1876, pp. 61–98.

Prof. Ray Lankester, M.A., F.R.S., read a memoir on the hearts of *Ceratodus*, *Protopterus*, and *Chimæra*. The structure of the conus arteriosus and its valves was more particularly described in this paper. Owen and Hyrtl had shown that the conus of the Dipnoans differed from that of cartilaginous fishes and Amphibians in the fact that its walls were devoid of pocket-valves, and presented instead a long spiral valve and a second short vertical valve. Dr. Günther, the only author who had described the heart of *Ceratodus*, showed that it possessed in the upper part of the arterial cone pocket-valves, whilst the spiral valve was shortened so as to be absent from this upper region. The possession of pocket-valves served as a very important character to connect the Dipnoans and the other fishes.

Prof. Lankester now showed that in the lower part also of the arterial cone of *Ceratodus* there were numerous small pocket-valves, in addition to those in its upper part; and further he showed that these small pocket-valves (so called "ganoid valves") were also present in the lower part of the arterial cone of *Protopterus*, the African Mud-fish, which had been generally supposed to be quite devoid of this kind of valve. The basal fibro-cartilage of the floor of the heart was described and compared in *Ceratodus* and *Protopterus*, and a possible rudiment of this remarkable structure pointed out in *Ceratodus*.

This Paper will be published entire, with illustrations, in the Society's 'Transactions.'

The following papers were read:—

1. On the Skull of a Rhinoceros (*R. lasiotis*, Scl.?) from India. By William Henry Flower, F.R.S., V.P.Z.S.

[Received October 12, 1877.]

Mr. Sclater has put into my hands for examination the skull of a Rhinoceros, which he had received from Dr. W. D. Stewart, of Cuttack, Orissa, being the skull of the two-horned Rhinoceros killed near Comillah, in Tipperah, as mentioned in P. Z. S. 1877, p. 269. Mr. Sclater thinks that the skull may not improbably belong to the species (at present only known by the living animal in the Society's menagerie) which he has named *R. lasiotis*.

It is that of a nearly adult animal. All the sutures of the upper surface of the cranium are consolidated; and all the permanent teeth in both jaws are in place except the posterior molars, which are still concealed in their alveoli.

In size and general conformation it resembles the skull of *R. sumatrensis*, and possesses all the essential characters[1] which distinguish that species from *R. indicus* and *R. sondaicus*, viz. the separation of the postglenoid from the posttympanic processes of the squamosal below the auditory meatus, the backward position of the occipital crest (though, perhaps, less marked than usual), and the

[1] See "On some Cranial and Dental Characters of the existing Species of *Rhinoceros*," P. Z. S. 1876, p. 443.

indication of a second or frontal horn. I have compared it with the eight skulls assigned to *R. sumatrensis* at present in London—four in the British Museum, and four in the Museum of the College of Surgeons.

These skulls present considerable individual variation in general conformation, proportional breadth to length, in the development and form of the nasal bones, number and position of the lachrymal foramina, form of the posterior margin of the palate, and other details. The present skull, however, is strikingly different from all in its superior breadth compared with its length, and especially the breadth and flatness of the frontal region. The annexed table of dimensions exhibits the extent of this peculiarity; and, to make it more manifest, I have added the ratio of the breadth, taken between the anterior margins of the orbits (where the difference is most characteristic), compared with the entire length of the skull, the latter being taken as 100. On looking down this column of the Table, it will be seen that, though there is a considerable variation among the

	Length from occipital crest to anterior extremity of nasals.	Greatest breadth across zygomata.	Breadth across anterior edge of orbits, in groove above lacrymal eminence.	Proportion of last to length as 100.	Breadth across maxillæ above middle of last premolar tooth.	Length of upper molar and premolar teeth (excluding first and last).	Proportion of last to length of skull as 100.
1. Adolescent (all permanent teeth except milk-molars), from Tipperah	20·0	12·0	6·8	34·0	7·3	8·0	40·0
2. Aged ♀. Malacca. Died in Zool. Gardens, 1872. B. M.	20·7	11·8	6·0	29·0	6·4	6·5	31·4
3. Aged ♀. Sumatra. Mus. R. C. S. No. 2933	20·4	11·1	5·2	25·5	6·1	6·6	32·6
4. Adult. Pegu. B.M.	21·4	11·1	5·9	27·6	6·6	6·9	32·7
5. Adolescent ♂ (all permanent teeth except last molars). Sumatra. M. R. C. S. No. 2935	23·0	12·0	6·0	26·1	7·0	7·6	33·0
6. Young (last milk-molar remaining). Sumatra. M. R. C. S. No. 2937	19·0	10·6	5·0	26·3	6·5	7·3	38·0
7. Young (dentition as last). B.M.	18·9	10·5	5·0	26·4	6·3	6·9	36·5
8. Younger (all milk-molars and first and second permanent molars). Sumatra. M. R. C. S. No. 2936	21·0*?	10·7	5·2	24·8?	6·4	7·0	33·3?
9. Still younger (all milk-molars and first permanent molars). Borneo. B. M.	18·1	9·6	5·0	27·6	6·2	Teeth nearly all lost.	

* Nasals broken.

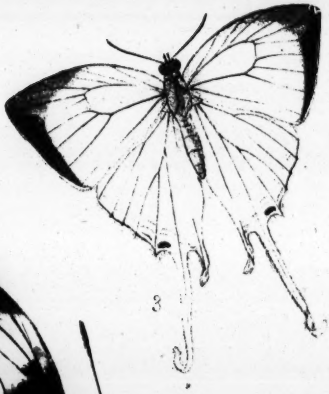
other skulls, the difference between the narrowest and widest being almost as great as that between the latter and the present skull, yet there are intermediate gradations in the former case, whereas the Tipperah skull is completely isolated from the others. It is curious that the skull which comes next to it in width is that of the small dark-coloured animal from Malacca, which died in the Society's menagerie in 1872, and of which the external characters were certainly quite unlike those of *R. lasiotis*.

A second peculiarity by which this skull is distinguished from all the others, and one to which I am inclined to attach still more importance, is the greater size of the teeth, especially the premolars, both absolutely and relatively. This is also seen in the Table, in which is given the absolute length of the series of molars and premolars, excluding the first and last, which are either absent or not developed in many of the specimens under consideration, and including, therefore, the three posterior premolars and the two anterior molars. In the case of the younger skulls, milk-molars occupy the place of premolars; but this probably does not materially affect the length of the series. It will be seen that in the present skull this length absolutely exceeds that of any of the others, and, relatively to the length of the skull (taken as 100), it is 40·0, whereas, of the other seven, five range between 31·4 and 33·3, and the other two, which give a higher figure, are both young animals, in which the skull had not attained its full dimensions, and the teeth therefore appear relatively larger than they otherwise would have been. It is probable that sex may affect the size of the teeth, as in the two known females (Nos. 2 and 3 of the list) they are smaller than in any of the others. Not only in antero-posterior diameter are the premolars larger in the present specimen, but still more notably in breadth. Thus the last premolar in the Pegu adult skull (No. 4) is 1″·8 in greatest breadth, in the Sumatran female (No. 3) 1″·85, in the Malaccan skull (No. 2) 1″·9, in the Sumatran male (No. 5) 2″·05, in the present skull 2″·2. The lower molars exhibit the same superiority of size; but in other respects the dentition does not differ appreciably from that of the various specimens of *R. sumatrensis*.

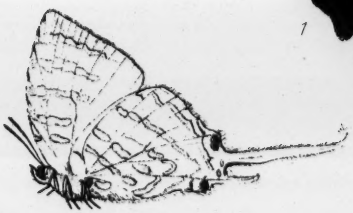
As an individual peculiarity may be noted the single lachrymal foramen on each side, whereas many of the others have two; but in both the Malacca and one of the other British-Museum skulls, the foramen is also single on both sides, and in the Pegu and one of the Sumatran specimens it is single on one and double on the other side. Again, the great amount of ossification in the base of the pterygoid fossa, at the posterior end of the vomer, forming a sort of "parasphenoid" mass, is worthy of note; but it is repeated in the Pegu skull, and partially in the old Sumatran specimen (No. 2), though not in the equally aged Malacca female.

I have pointed out the peculiarities of this skull, which are interesting in connexion with the fact that it was obtained from a locality quite beyond the hitherto known range of the Sumatran Rhinoceros; but, in the absence of other evidence, will not attempt to decide whether they should be considered of specific value.













Hanhart imp.

NEW LEPIDOPTERA

2. Catalogue of Lepidoptera collected by Mr. S. N. Walter in the Island of Billiton. Rhopalocera by F. D. Godman and Osbert Salvin; Heterocera by H. Druce.

[Received May 17, 1878.]

(Plate XL.)

RHOPALOCERA.

That the Rhopalocerous fauna of Billiton should largely partake of the character of that of the surrounding islands of Sumatra, Java, and Borneo, and of the peninsula of Malacca was to be anticipated. Of the thirty-three species represented in this collection (which was made in Billiton by Mr. S. N. Walter, and has been sent to us by Lord Tweeddale for examination), all but one are well-known forms from one or all of these islands. The single exception, the *Myrina*, described below, has, so far as is at present known, its sole representative in a nearly allied species from Tenasserim, also described in the present paper.

The differential elements of the Butterfly faunas of Borneo, Sumatra, Java, and Malacca have not yet been traced with sufficient precision to enable us to say to which of the four localities the island of Billiton has most affinity. With Borneo it is certainly very closely allied; but it possesses several species in common with Java, and others with Malacca. Unfortunately our series of Sumatran Butterflies is not very complete; but, so far as we can see, many species are also found in that island, geographically its nearest neighbour.

Fam. Nymphalidæ.

Subfam. Danainæ.

1. Hestia clara.

Hestia clara, Butl. Trans. Ent. Soc. ser. 3, v. p. 469.
? *Hestia leuconoe*, Druce, P. Z. S. 1873, p. 337.

A single female specimen, agreeing with Mr. Butler's types in the British Museum. The species also occurs in Borneo, whence we have an example of the same sex. Its occurrence in Java is doubtful.

2. Danais philomela.

Euplœa philomela, Zink. Nov. Act. Ac. Nat.-Cur. xv. p. 184, pl. 16. f. 17; Druce, P. Z. S. 1873, p. 337.

Agrees with Malaccan and Bornean examples.

3. Danais similis.

Papilio similis, Linn. Syst. Nat.
Danais similis, Druce, P. Z. S. 1873, p. 338.

Identical with Malaccan and Javan examples.

4. Danais juventa.

Papilio juventa, Cr. Pap. Ex. pl. 188. f. B.
Danais juventa, Druce, P. Z. S. 1873, p. 337.

Agrees with Bornean specimens.

5. Danais hegisippus.

Papilio hegisippus, Cr. Pap. Ex. t. 180. f. A.

Agrees with Malaccan specimens.

6. Danais chrysippus.

Papilio chrysippus, Linn. Cr. Pap. Ex. t. 118. f. B, C.

Identical with specimens of this widely dispersed species.

7. Euplœa menétriésii.

Euplœa ménétriésii, Feld. Wien. ent. Mon. iv. p. 398; Druce, P. Z. S. 1873, p. 338.

Agrees with specimens thus named in the British Musium.

8. Euplœa bremeri.

Euplœa bremeri, Feld. Wien. ent. Mon. iv. p. 398; Druce, P. Z. S. 1873, p. 338.

Found also in Borneo and Malacca.

9. Euplœa thoosa.

Trepsichrois thoosa, Hübn. Ex. Schmett. t. viii.

Agrees very well with Hübner's figure, being also identical with Malaccan specimens.

10. Euplœa mulciber.

Papilio mulciber, Cram. Pap. Ex. t. 127. f. C, D; Druce, P. Z. S. 1873, p. 338.

Also a Bornean species.

Subfam. Elymniinæ.

11. Elymnias nigrescens.

Elymnias nigrescens, Butl. P. Z. S. 1871, p. 520, t. 42. f. 1; Druce, P. Z. S. 1873, p. 340.

A female specimen agreeing with Bornean examples of the same sex.

12. Elymnias lais.

Papilio lais, Cr. Pap. Ex. t. 110. f. A, B.

Elymnias lais, Druce, P. Z. S. 1873, p. 340.

Also found in Borneo and Java.

Subfam. Morphinæ.

13. Amathusia phidippus.

Papilio phidippus, Linn. Syst. Nat.

Amathusia phidippus, Druce, P. Z. S. 1873, p. 340.

Both sexes of this widely ranging species.

14. Zeuxidia horsfieldi.

Zeuxidia horsfieldi, Feld. Voy. Nov. Lep. p. 460, t. 62. f. 4; Druce, P. Z. S. 1873, p. 340.

Agrees with Bornean specimens.

Subfam. Nymphalinæ.

15. Cynthia deione.

Cynthia deione, Erichs. Nov. Act. Ac. Nat.-Cur. xvi. Suppl. t. 50. f. 2, 2 *a*.

Cynthia arsinoe, Druce, P. Z. S. 1873, p. 342 (nec Cramer).

Agrees with this widely-ranging species, of which we have specimens from Java, Malacca, Borneo, and the Philippine Islands.

16. Junonia laomedia.

Papilio laomedia, Linn. Syst. Nat. i. p. 772.

Junonia laomedia, Druce, P. Z. S. 1873, p. 342.

A widely-distributed species, occurring throughout the Indo-Malayan subregion.

17. Junonia ida.

Papilio ida, Cr. Pap. Ex. t. 42. f. C, D.

Junonia ida, Druce, P. Z. S. 1873, p. 342.

Agrees with Javan, Bornean, and Philippine-Islands specimens.

18. Neptis aceris.

Papilio aceris, Lepechin, Tageb. d. Reise Russ. Reich. i. p. 203, t. 17. f. 5.

Neptis aceris, Druce, P. Z. S. 1873, p. 344.

A single specimen of this very widely-distributed species.

19. Tanaëcia, sp.?

A single specimen of a species of this genus which we have not been able to determine.

20. Adolias, sp.?

Agrees with a Malaccan specimen of an unnamed species in our collection. Others from the same locality in the British Museum, have a MS. name of Mr. Butler's attached to them.

21. Symphædra dirtea.

Papilio dirtea, Fabr. Ent. Syst. iii. p. 59.

Symphædra dirtea, Butl. P. Z. S. 1868, p. 613; Druce, P. Z. S. 1873, p. 346.

Adolias boisduvali, Bdv. Sp. Gén. t. 8. f. 2.

A male agreeing with Sumatran and Bornean examples.

22. CHARAXES SCHREIBERI.

Nymphalis schreiber, Godt. Enc. Méth. ix. p. 825.
Charaxes schreiberi, Druce, P. Z. S. 1873, p. 346.
Found also in Java and Borneo.

Fam. LYCÆNIDÆ.

23. MYRINA NIVEA, sp. n. (Plate XL. figs. 3, 4.)

♀. Exp. 2·2 inches. Secondaries with projection at the anal angle and a long tail on the first median branch; outer margin slightly dentate, pure white; outer margin of primaries black, blending into a delicate blue in the apex, the blue colour extending along the costal margin; a black spot between the median branches of the secondaries and a faint black submarginal line on the same wings. Beneath pure white, both wings crossed with five concentric bands, consisting of confluent spots, each enclosed in a faint dark line; a submarginal black line to both wings; the black spot of the upper surface between the median branches of the secondaries is mostly blue; and there are two blue spots near the margin, one between the submedian nervure and the first median branch, and one at the anal angle.
Hab. Billiton Island.
Mus. nostr.

This beautiful species, of which there is only a single female specimen in the collection, seems to belong undoubtedly to the genus *Myrina*, as defined by Westwood (D. W. & H. Gen. Diurn. Lep. ii. p. 475). In coloration it is quite distinct from any hitherto described member of the genus. We have, however, since received from Mr. A. O. Hume an example of a closely allied species, which was taken at Meetan in Burma. This is also a female, and we describe it as follows:—

MYRINA HIEMALIS. (Plate XL. figs. 5, 6.)

Exp. 2·2 inches. In shape exactly like *M. nivea*, the dark apex of the primaries more extensive and the inner edge of this dark mark with two prominent indentations instead of being simply curved; beneath, the bands of the wings are better defined, and the dark marginal lines of each band enclose a greyish space, whereas in *M. nivea* the inside of the spots forming the bands is white.
Hab. Meetan, Burma.
Mus. nostr.

Fam. PAPILIONIDÆ.

Subfam. PIERINÆ.

24. CALLIDRYAS CATILLA.

Papilio catilla, Cr. Pap. Ex. t. 55. f. C, D.
Callidryas catilla, Druce, P. Z. S. 1873, p. 355.
A widely ranging species found in Borneo and elsewhere.

25. TERIAS, sp.?

A bad specimen.

26. Terias hecabe.

Papilio hecabe, Linn. Syst. Nat. i. p. 763.
Terias hecabe, Druce, P. Z. S. 1873, p. 354.
A widely ranging species, also found in Borneo.

Subfam. Papilioninæ.

27. Papilio antiphates.

Papilio antiphates, Cr. Pap. Ex. t. 72. f. A, B; Druce, P. Z. S. 1873, p. 357.
Agrees with Bornean specimens.

28. Papilio sarpedon.

Papilio sarpedon, Linn. Syst. Nat. i. p. 747; Druce, P. Z. S. 1873, p. 559.
A wide-ranging species, found in Borneo and Malacca.

29. Papilio eurypylus.

Papilio eurypylus, Linn. Syst. Nat. i. p. 754; Druce, P. Z. S. 1873, p. 357.
Agrees with Bornean examples.

30. Papilio pammon.

Papilio pammon, Linn. Syst. Nat. i. p. 746.
Papilio polytes, L. Druce, P. Z. S. 1873, p. 357.
The caudal appendage in Billiton specimens is but slightly developed; and in this respect they agree best with Javan examples.

31. Papilio iswara.

Papilio iswara, White, Entom. i. p. 280; Doubl. & Hew. Gen. D. Lep. t. 3. f. 1.
Agrees with a Malaccan specimen.

32. Papilio memnon.

Papilio memnon, Linn. Syst. Nat. i. p. 747; Wall. Trans. L. S. xxv. p. 47, pl. 1. figs. 2, 4.
A female agrees with Javan specimens and with figure 4 of Mr. Wallace's plate, and with Cramer's figure of his *P. achates*. A second female resembles figure 2 of Mr. Wallace's plate, except that the white band of the secondaries is slightly narrower. This form is represented by Cramer under the name *P. agenor*.

Fam. Hesperidæ.

33. Casyapa thrax.

Papilio thrax, Linn. Syst. Nat. i. p. 794.
Casyapa thrax, Druce, P. Z. S. 1873, p. 358.
Agrees with Indian examples.

HETEROCERA.

Fam. Sphingidæ.

Subfam. Chærocampinæ.

Chærocampa suffusa, Walk. List Lep. Brit. Mus. Het. pt. viii. p. 146 (1856).

The type was obtained at Hong-Kong. Mr. Moore tells me he has specimens from Borneo.

Fam. Lithosiidæ.

Hypsia silvandra, Cr.

Phalæna (*Bombyx*) *silvandra*, Cram. Pap. Exot. iv. pl. 369. f. D (1782).

Fam. Saturniidæ.

Antheræa billitonensis, Moore, n. sp.

Male. Upperside pale purplish ferruginous, suffused with grey on external borders; ocelli oval, defined by a narrow dusky line, blind, outer half bordered within by a narrow yellow line and a central transverse line: *fore wing* with the area within and below the cell brighter ferruginous; apex yellowish; an oblique discal, pale ferruginous, narrow lunular band, bordered within by a dusky lunular line and without by a straight dusky line; a dusky black streak crossing the middle of the cell, and another from its base to the hind margin: *hind wing* with the base brighter ferruginous; a dusky-bordered, pale yellowish, transverse, discal, sinuous band, the dusky border encircling the ocellus and terminating on abdominal margin above end of sinuous band. Body bright ferruginous.

Expanse 4¼ inches.

Hab. Billiton Island, Malay archipelago. In coll. H. Druce.

Nearest allied to *A. frithii*, from Darjiling.

Fam. Erebidæ.

Nyctipao crepuscularis.

Phalæna (*Attacus*) *crepuscularis*, Linn. Syst. Nat. 2811. 13; Clerck, Icon. pl. 53. f. 1–4; Drury, Ins. i. p. 37, pl. 20. f. 1, 2.

A species frequently sent from Hindostan.

Fam. Hypopyridæ.

Hypopyra feniseca.

Hypopyra feniseca, Guén. Noct. iii. 200. 1599 (1852).

In the British Museum, from Silhet.

Tribe Uranides.

Fam. Nyctalemonidæ.

Nyctalemon docile, Butler, in litt.

Very closely allied to *Nyctalemon hector*, White, from Borneo,

the principal difference being its larger size, broader white bands, and longer tails to the posterior wing. Mr. Butler's description has been in the hands of the Linnean Society for some time.

GEOMETRIDÆ.

Fam. ENNOMIDÆ.

ENNOMOS TESTACEARIA.

Ennomos testacearia, Moore, P. Z. S. 1867, p. 623.

EXPLANATION OF PLATE XL.

Figs. 1, 2. *Dolcschallia comrii*, p. 646.
3, 4. *Myrina nivea*, p. 640.
5, 6. —— *hiemalis*, p. 640.

3. List of the Butterflies collected in Eastern New Guinea and some neighbouring Islands by Dr. Comrie during the Voyage of H.M.S. 'Basilisk.' By F. D. GODMAN and OSBERT SALVIN.

[Received May 17, 1878.]

(Plate XL.)

The small collection made by Dr. Comrie, of which we here give a list, was got together under many difficulties and pressure of official duties. It is therefore not surprising that the number of species it contains is not greater than it is. We make no apology for presenting this list to the Society, seeing that several of the places touched at by Captain Moresby's expedition were absolutely unknown as to their Butterfly-fauna before Dr. Comrie visited them. Amongst these we may specially mention the D'Entrecasteaux Islands, which lie some little way from the eastern shores of New Guinea. The result of a comparison of the Butterflies of these islands with those of the New-Guinea mainland shows that, so far as we can see at present, no difference can be said to exist. In fact these islands are (as far as their Butterflies are concerned) as essentially a portion of New Guinea as the Aru Islands are known to be, if not more so.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

DANAIS CITRINA.

Danais citrina, Feld. Voy. Nov. Lep. p. 350, t. 42. f. 5–7.
Danais gloriola, Butl. P. Z. S. 1866, p. 56.

D'Entrecasteaux Islands.

Agrees with specimens from the Aru Islands, whence both Dr. Felder's and Mr. Butler's types were obtained.

DANAIS AFFINIS.

Papilio affinis, Fabr. Syst. Ent. p. 511.

Danais affinis, Blanch. Voy. Pôle Sud, Zool. iv. p. 389; Atl. Lep. t. 2. f. 7.

D'Entrecasteaux Islands and mainland of New Guinea.

A widely-ranging species, found in the islands neighbouring New Guinea and also North Australia, whence it was originally described.

EUPLŒA CALLITHOE.

Euplœa callithoe, Boisd. Voy. Astr. Ent. p. 93; Kirsch, Mitth. k. z. Mus. z. Dresden, i. p. 115.

D'Entrecasteaux Islands.

A single specimen agrees with one of Dr. Meyer's examples obtained in North-western New Guinea.

EUPLŒA IPHIANASSA?

Euplœa iphianassa, Butl. P. Z. S. 1866, p. 287.

D'Entrecasteaux Islands and mainland of New Guinea.

These specimens only agree approximately with Mr. Butler's type, which came from New Hebrides. The chief difference consists in the absence in the male of the submarginal row of spots on the underside of the secondaries.

EUPLŒA NOX?

Euplœa nox, Butl. P. Z. S. 1866, p. 278.

D'Entrecasteaux Islands.

An imperfect specimen, probably of this species, the type of which was obtained in the Aru Islands.

EUPLŒA EURIANASSA.

Euplœa eurianassa, Hew. Ex. Butt., *Eupl.* i. f. 2.

D'Entrecasteaux Islands.

Described from a specimen taken on board ship, off the coast of New Guinea.

EUPLŒA TREITSCHKII?

Euplœa treitschkii, Boisd. Voy. Astr. Ent. p. 98; Salv. & Godm. P. Z. S. 1877, p. 142.

D'Entrecasteaux Islands.

A single female specimen probably belongs to this species, though it differs somewhat from our specimen from Duke-of-York Island as regards the arrangement of the spots on the secondary wings. The specimen is in poor condition.

HAMADRYAS ZOILUS.

Papilio zoilus, Fab. Syst. Ent. p. 480.

D'Entrecasteaux Islands and mainland of New Guinea.

Subfamily Satyrinæ.

Mycalesis medus.

Papilio medus, Fabr. Syst. Ent. p. 488.

Mainland of New Guinea.

A single tattered specimen seems to belong to this widely-ranging species. The white cross bands of the underside are nearly obsolete.

Mycalesis dorycus.

Satyrus dorycus, Boisd. Voy. Astr. Ent. p. 152.

D'Entrecasteaux Islands and mainland of New Guinea.

Dr. Comrie's specimens agree with Boisduval's description in not having any of the fulvous colour of the secondaries near the anal angle of the primaries. In this respect they differ from Guérin's figure of his *S. duponchelii* (Voy. Coq. Zool. Atl. Ins. t. 17. f. 3). The ocelli on both wings are small, and differ much in size from those of the female figured by Hewitson (Ex. Butt. *Myc.* t. 2. f. 7, 10).

Subfamily Morphinæ.

Drusilla catops.

Drusilla catops, Westw. Gen. D. Lep. p. 335, note; Trans. Ent. Soc. ser. 2, iv. p. 181.

D'Entrecasteaux Islands and mainland of New Guinea.

Drusilla myops.

Drusilla myops, Feld. Wien. ent. Monatschr. iii. p. 109, t. 1. f. 1.

D'Entrecasteaux Islands and mainland of New Guinea.

These specimens agree fairly with Dr. Felder's figure; the white spot on the primaries, however, is more elongated, and the basal portion of the secondaries much paler.

Subfamily Nymphalinæ.

Cethosia chrysippe.

Papilio chrysippe, Fab. Syst. Ent. p. 502; Donov. Ins. N. Holl. t. 24.

D'Entrecasteaux Islands and mainland of New Guinea.

Agrees with North-Australian and New-Guinea specimens.

Rhinopalpa amelia.

Vanessa amelia, Guér. Voy. Coq. Zool. p. 278, t. 14 bis. f. 1.

D'Entrecasteaux Islands and mainland of New Guinea.

Agrees closely with Guérin's figure. We much doubt whether *R. algina*, Boisd., is really distinct. The figure of the latter in the 'Voyage au Pôle Sud' does not seem to be very accurately drawn.

CYNTHIA ARSINOE.

Papilio arsinoe, Cr. Pap. Ex. t. 160. f. A, B.

Mainland of New Guinea.

A single female specimen.

JUNONIA IPHITA.

Papilio iphita, Cr. Pap. Ex. t. 209. f. C, D.

Mainland of New Guinea.

JUNONIA VELLIDA.

Papilo vellida, Fab. Mant. Ins. ii. p. 35; Donov. Ins. N. Holl. t. 25. f. 3.

Mainland of New Guinea.

DOLESCHALLIA COMRII, n. sp. (Plate XL. figs. 1, 2.)

♀. Expanse 4 inches. Outer third of both wings dark blackish brown, basal portion reddish brown; a subtriangular large white patch on primaries beyond the cell, its base on the costa, its apex nearly reaching the inner margin; a black spot at the end of the cell; between the white patch and the apex are four white spots, placed transversely in an irregular line, and below them, on either side of the lower radial, two irregular bluish spots. Beneath reddish brown; a straight band crosses the secondaries near the middle and passes into the primaries, on the inner side margined with white; and outside it (running parallel) is a dark brown band; the white spots show as on the upperside of the primaries; and on the secondaries are two ocelli—one between the first and second median branches, the other between the middle and upper radials.

Mainland of New Guinea (*Dr. Comrie*).

The sexes in the members of this genus do not differ to a great extent; so that we may expect the male of this species to be somewhat similar to the female specimen now described. There is no described member of the genus which the present species is at all like. This, we trust, will be sufficiently apparent from the figure on the Plate accompanying this paper. There is only a single specimen in Dr. Comrie's collection.

CYRESTES ACILIA.

Nymphalis acilia, Godt. Encyc. Méth. ix. p. 478.

Mainland of New Guinea.

Agrees with other New-Guinea specimens, and with others from Waigiou.

ATHYMA VENILIA.

Papilio venilia, Linn. Syst. Nat. i. p. 780.

Mainland of New Guinea.

Agrees with Amboina and New-Guinea specimens.

ATHYMA LACTARIA.

Athyma lactaria, Butl. Ann. & Mag. N. H. ser. 3, xvii. p. 98.

Mainland of New Guinea.

Agrees with the specimens in the British Museum.

DIADEMA NERINA.

Papilio nerina, Fab. Syst. Ent. p. 509; Donov. Ins. N. Holl. t. 27. f. 1.

D'Entrecasteaux Islands.

A female specimen, agreeing with others from Australia.

DIADEMA ALIMENA.

Papilio alimena, Linn. Syst. Nat. i. p. 780.

D'Entrecasteaux Islands.

Agrees with Amboina specimens.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. p. 763.

Mainland of New Guinea.

Subfamily PAPILIONINÆ.

ORNITHOPTERA POSEIDON.

Papilio poseidon, Doubl. Ann. & Mag. N. H. xix. p. 173; Wall. Trans. L. S. xxv. p. 35.

Possession Bay and D'Entrecasteaux Islands.

Dr. Comrie obtained a number of specimens of Ornithoptera (mostly females) in these two localities. Unfortunately most of them are in broken condition; but enough remains to show an interesting range of variation in the females—enough, indeed, still further to discredit the many species of the *O.-priamus* group that have been attempted to be set up at various times.

Some of the females from Possession Bay have the primaries spotless brown; others show a trace of the light-coloured spot near the end of the cell. The specimens from D'Entrecasteaux Islands are strongly marked, indeed as much so as female examples of *O. arruana*.

Unfortunately, Dr. Comrie's collection contains only one male (from Possession Bay) in a condition to compare with examples from other localities. This seems to agree closely with typical specimens of *O. arruana*, the apical angle of the secondaries being perhaps rather less acute; but the difference is very slight. Comparing this with Montrouzier's description of his *O. boisduvalii*, from Woodlark Island (no great distance from Dr. Comrie's locality), we find it agree in every respect.

So far, then, as we can see, these specimens tend to confirm the

accuracy of Mr. Wallace's views on these Ornithopteræ, expressed in his paper on the Papilionidæ of the Malayan region.

PAPILIO ERECHTHEUS.

Papilio erechtheus, Donov. Ins. N. Holl. t. xiv., xv.

Mainland of New Guinea.

A female, agreeing with specimens from Moreton Bay, Australia.

PAPILIO EUCHENOR.

Papilio euchenor, Guér. Voy. Coq. Zool. p. 273, t. 13. f. 3.

Mainland of New Guinea.

PAPILIO POLYDORUS.

Papilio polydorus, Linn. Syst. Nat. i. p. 746; Wall. Trans. L. S. xxv. p. 42.

Mainland of New Guinea.

These specimens have a light spot on the primaries; and the secondaries are more elongated than in *P. leodamas*, Wall., the species we should have expected to find here. They do not differ from the ordinary type of *P. polydorus*.

4. Description of a new Species of the Orthopterous Genus *Phylloptera* from Madagascar. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received May 23, 1878.]

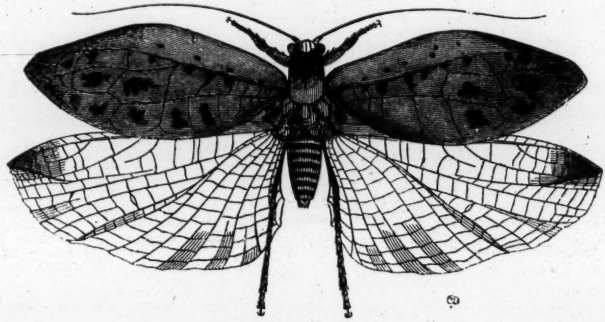
The genus *Phylloptera* is one of the numerous interesting groups amongst the Orthoptera which exhibit a striking resemblance to leaves, some of them being imitated in a green condition, and others when faded.

The species now before me is an admirable example of this adaptation to surrounding conditions, the tegmina being quite like sear and yellow leaves in which the brown patches of decay have begun to appear.

PHYLLOPTERA SEGONOIDES, n. sp.

Tegmina of the normal elliptical form; horn yellow, with the veins and borders more or less tinted with burnt sienna; the whole of the areoles, excepting those along the anterior border, with central irregular dull greyish-brown spots or patches; under surface paler, with greenish borders; wings hyaline-white, veins yellowish, the normal black-dotted horn-yellow cuneiform patch bounded by an oblique brown line at the very acuminate apex; frons testaceous; eyes (in the dead example) chocolate-brown; antennæ black, with testaceous scape; back of head sordid whitish, with two divergent grey lines from behind the antennæ; pronotum black, whitish in front, with the sides, posterior third, and a V-shaped central

marking pale castaneous; meso- and metathorax glassy greyish, with two or three opaque whitish spots; abdomen sordid testaceous, sides of the venter whitish; pectus and posterior coxæ whitish; anterior femora with the upper or interior surface castaneous at the proximal end, otherwise greyish, spotted with cream-colour, with two small tuberculose castaneous dots and a short longitudinal black dash, three black denticles along the supero-interior margin, inferior or exterior surface deeply grooved, paler, the distal half sordid whitish, with an irregular longitudinal brown dash; tibiæ with the proximal half whitish, expanded, compressed, and marked on each side by two deep pyriform impressed spots, distal half cylindrical, castaneous in the centre and black at the extremities, interior margin with three fine spinules; tarsi black, the terminal joint



Phylloptera segonoides.

castaneous, with black claws: middle pair of legs longer than the anterior pair, the tibiæ yellowish, banded with black across the centre and at each end, without the impressed markings of the anterior pair: posterior legs with the femora compressed, tawny, with an external longitudinal blackish lateral streak, inferior margin deeply grooved, its exterior edge with four short black denticles; tibiæ above flattened, slaty grey, with the distal end and a lateral series of triangular spots cream-coloured, twelve black denticles along the inner and eight along the outer margin, otherwise castaneous, subcylindrical, with about eleven delicate little spinules along the inferior margin; tarsi as in the other legs. Length of the body 23 millims., of the tegmina 91 millims., of the wings 96 millims.

This species much resembles the New-World genus *Segona*, but differs markedly in the structure of the anterior pair of legs.

5. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. XI. On the Steganopodes and Impennes. By P. L. Sclater, M.A., Ph.D., F.R.S, and Osbert Salvin, M.A., F.R.S.

[Received May 24, 1878.]

a. STEGANOPODES.

Of this order the collection contains 33 specimens belonging to 9 species, as follows :—

1. Fregatidæ.

1. Fregata aquila (Linn.).

a, adult,
b, young,
c, young,
} Ascension Island (March 1876).

2. Fregata minor (Gm.).

Attagen ariel, Gould, B. Austr. vii. pl. 72.

133, male, Raine Island.

"Legs and feet black; bill grey; skin of throat red; eyes red. The skin of the throat is of a lighter red in the male than in the female. The stomach contained remains of cuttlefish, *Spirula*, and a fish."—*J. M.*

134, female,
135, young, female,
136, nestling, female,
} Raine Island.

"Feet red; eyes red. The bill and feet of the young birds are of a white colour with a shade of blue; eyes black.

"In the adult birds the male has the eyelids, feet, and eyes black. The female has these parts red. This holds good in all our specimens."—*J. M.*

144, female, Raine Island.

482, male, Admiralty Island.

"Eyes black; flesh of throat red. Stomach contained fish. I shot this bird from the pinnace while with several others. It was hovering over a shoal of fish. A Noddy and Black-headed Terns, and a Puffin or Petrel, larger than a Cape-Pigeon, were also fishing."—*J. M.*

The series before us, so far as it goes, tends to show that this smaller Frigate-bird may remain distinct from its larger brother, although we are not aware of any other obvious point of difference than that of size.

The specimens measure as follows :—

	Wing.	Bill from gape.
Fregata aquila, *a*	23·5	5·0
,, ,, jr., *b*.....	23·0	4·5
,, ,, jr., *c*.....	22·0	4·4

		Wing.	Bill from gape.
Fregata minor	♂, 133	20·5	3·9
„ „	♀, 134	20·5	4·0
„ „	♀, 144	20·5	4·0
„ „	♂, 482	20·5	4·0

The bill of *F. minor* is also narrower at the base, and more feeble.

2. Phaëthontidæ.

3. Phaëthon æthereus, Linn.

a, Ascension Island (1876, March).

143, female (young), Raine Island.

"Eyes black, legs white, claws black, bill dark brown colour. The only one seen on the island."—*J. M.*

4. Phaëthon flavirostris, Brandt.

a, *b*, } Fernando Noronha (Sept. 1873).

c, male, *d*, male, } Ascension (March 1876).

e, female, Tongatabou.

507, female, at sea, 19th March, 1875.

"Eyes black, legs lake-white. The claws and membrane between the toes quite black. Bill pale yellow. Came on board the ship on the morning of the 19th March, 1875, before daylight. The bill of a cuttlefish was in the stomach."—*J. M.*

3. Pelecanidæ.

5. Sula leucogastra (Bodd.).

Pelecanus sula, Linn. S. N. i. p. 218.
Le Fou de Cayenne, Buff. Pl. Enl. 973, undè
Pelecanus leucogaster, Bodd. Tabl. de Pl. Enl. p. 57.
Sula leucogastra, Salvin, Trans. Zool. Soc. ix. p. 496.

141, male, Raine Island.

"Eyes grey; feet light green; bill bluish towards the base, white at the tip."—*J. M.*

510, female, at sea.

"Eyes white or light grey. Stomach had cuttlefish; feet yellow with green tinge; bill flesh-colour, cere greenish. Came on board the ship on the evening of the 6th April, 1875."—*J. M.*

a, female. Ascension (March 1876).

b, *c*, } St. Paul's rocks, Atlantic (August 1873).

6. Sula piscator (Linn.).

Pelecanus piscator, Linn. S. N. i. p. 217.
Dysporus piscator, Finsch et Hartl. Orn. Centr.-Polyn. p. 255.

123, female, off Cape York, at sea.

"Eyes brown; bill and throat light blue-reddish towards the base,

and the tips of both mandibles brown; feet coral-red. The stomach contained cuttlefish about 3½ and 4 inches long, allied to *Gonatus amœnus*, and the caudal portion of a fish. There were a great many lice on this bird (preserved in a tube)."—*J. M.*

139, female, Raine Island.

"Eyes hazel; feet red; bill light blue, red towards the base. Stomach contained fish and cuttlefish."—*J. M.*

7. SULA CYANOPS, Sund.

Sula cyanops, Sund. Phys. Sällsk. Tidsckr. 1837, p. 218.
Dysporus cyanops, Finsch et Hartl. Orn. Centr.-Pol. p. 252.

137 and 138, females, Raine Island.

"Eyes yellow, skin of the throat black, legs and feet slate-colour. Stomach contained fish and cuttlefish."—*J. M.*

8. PHALACROCORAX IMPERIALIS.

Phalacrocorax imperialis, King, P. Z. S. 1831, p. 20.
Phalacrocorax carunculatus, Scl. et Salv. Ibis, 1870, p. 500.

637, male, Core Harbour, Messier Channel.

"Eyes brown. Stomach had shells."—*J. M.*

This Cormorant appears to be different from the *P. carunculatus* of New Zealand, with which we have hitherto united it, having a broad white patch on the middle of the back in the adult plumage, no crest, and the white extending further over the cheeks. Both species have the white bar on the upper wing-coverts.

The species of the Falkland Islands which has hitherto been called *Ph. carunculatus* (Scl. P. Z. S. 1860, p. 391; Abbott, 'Ibis,' 1861, p. 166) is again different, having a recurved crest and the caruncles on the front largely developed. It should probably stand as *P. albiventris*, Lesson's *Carbo albiventer* (Trait. d'Orn. p. 604) being apparently based upon the young of this species.

9. PHALACROCORAX VERRUCOSUS.

Halieus (*Hypoleucus*) *verrucosus*, Cab. Journ. f. O. 1875, p. 450.
Halieus verrucosus, Cab. et Reich. Journ. f. O. 1876, p. 359, tab. 1.
Phalacrocorax verrucosus, Sharpe, Zool. of Kerguelen, p. 49.

a, male,
b, male,
c, male (young),
d, female,
e, female,
f, sex ind., } Betsy Cove, Kerguelen Land, January 1874.

The series of this Shag is quite sufficient to warrant us in adhering to the species as distinct. The principal characters are clearly pointed out by Dr. Cabanis in his original description; and a good figure is given of the adult male under the second reference given above. Not one of the six specimens, of which *a*, *b*, and, apparently, *f* are adult, shows any traces of the white line along the upper wing-coverts

or of the white spot in the middle of the back which distinguish *P. imperialis*. The female, *d*, is in young plumage.

b. IMPENNES.

Of Penguins the collection contains 37 specimens, belonging to 6 species.

1. APTENODYTES LONGIROSTRIS.

Apterodyta longirostris, Scop. Del. Faun. et Flor. Ins. ii. p. 91.
Aptenodytes longirostris, Coues, Pr. Ac. Phil. 1872, p. 193; Sharpe, Zool. Kerg. p. 52.

a, Kerguelen Land.
b, Christmas Harbour, Kerguelen.
c, Marion Island.
734, female, 735, male, } Falklands.

"Eyes brown; the stomach of the female had the remains of cuttlefish, there being many beaks of these and also a weed-like substance. Female weighed 20 lb.; skin of male weighed 10 lb."—*J. M.*

2. PYGOSCELES TÆNIATUS.

Aptenodytes papua, Forst. Nov. Comm. Gott. iii. p. 140, tab. iii.
Aptenodytes tæniata, Peale, U.S. Expl. Exp. p. 264 (1848).
Pygosceles wagleri, Scl. P. Z. S. 1860, p. 390.
Pygosceles tæniata, Coues, Pr. Ac. Phil. 1872, p. 195; Sharpe, Zool. Kerg. p. 54.

a, *b*, *c*, *d*, *e*, *f*, } Kerguelen Land.

3. SPHENISCUS DEMERSUS.

Diomeda demersa, Linn. S. N. i. p. 214.
Spheniscus demersus, Temm. Tabl. Méth. p. 107 (1836).

a, *b*, *c*, *d*, } Cape of Good Hope.

4. SPHENISCUS MAGELLANICUS.

Aptenodytes magellanicus, Forst. Nov. Comm. Gott. iii. p. 143, tab. v.
Spheniscus magellanicus, Scl. P. Z. S. 1860, p. 382.
Spheniscus demersus, var. *magellanicus*, Coues, Pr. Ac. Phil. 1872, p. 209.

689, male, Port Churrucha.

"The only one seen. Eyes hazel; the stomach had many portions of fish, some of considerable size; upper part of the feet white, bill black or slate-coloured."—*J. M.*

741, female, Falklands.

"Eyes brown; stomach had fish."—*J. M.*

In our opinion this species is quite distinct from *S. demersus* of the Cape, having a double band on the chest, as is well represented in Forster's figure.

5. EUDYPTES CHRYSOLOPHUS.

Aptenodytes chrysocome, Forst. N. Comm. Gott. iii. p. 135.
Catarractes chrysolophus, Brandt, Bull. Ac. Pét. ii. p. 315.
Eudyptes chrysolophus, Scl. Ibis, 1860, pp. 338, 432, et P. Z. S. 1860, p. 390; Abbott, Ibis, 1861, p. 163; Sharpe, Zool. Kerg. p. 57.
Eudyptes diadematus, Gould, P. Z. S. 1860, p. 419.

a–c, males, *d*, female, *e*, pale var., } Christmas Harbour, Kerguelen.

On comparison of the Kerguelen specimen with others from the Falklands we find no reason for considering them otherwise than of the same species. There is, however, less appearance of the white upper tail-coverts in the Falklands specimens. Why Mr. Sharpe should have supposed that *E. chrysolophus* (Sclater et Abbott) of the Falklands was his *E. saltator* we cannot understand.

Forster evidently had both the "Rock-hopper" and "Macaroni" Penguins under his eyes when he described his *Apt. chrysocome*[1]. Brandt first clearly separated the two species, which are quite distinct and easily recognized by the character which Brandt gives.

The type specimen of *E. diadematus*, Gould, for which we have made every inquiry, is unfortunately no longer to be found. Mr. Gould has parted with it, he knows not whither. It was *probably* only an individual variety of this species.

6. EUDYPTES CHRYSOCOME.

Aptenodytes chrysocome, Forst. N. Comm. Gott. iii. p. 135 (partim).
Catarractes chrysocome, Brandt, Bull. Ac. Pét. ii. p. 314.
Eudyptes chrysocome, Scl. P. Z. S. 1860, p. 390.
Eudyptes nigrivestris, Gould, P. Z. S. 1860, p. 418.
Eudyptes saltator, Sharpe, Zool. Kerg. p. 60.

a–e, Inaccessible Island.
f, male, *g–k*, } Kerguelen.
l, *m*, males, *n*, young, } Falklands.

On comparison of the series from these three localities we cannot satisfactorily recognize more than one species of "Rock-hopper." The bird from Inaccessible Island has the elongated superciliary

[1] He describes the crest "in aliis individuis in fronte unita, in aliis divisa" (*l. s. c.* p. 137).

plumes more produced; those of the Falklands and Kerguelen have them rather shorter.

As regards the Australian and New-Zealand bird (*E. pachyrhynchus* of Gray), to which Mr. Sharpe proposes to restrict the name *chrysocome* of Forster, we likewise doubt its distinctness. The only differential characters given by Mr. Sharpe consist in the relative lengths of the black and yellow feathers of the superciliary tufts. At the same time we should like to examine a series of this form before pronouncing a decided opinion on the point.

June 18th, 1878.

Arthur Grote, Esq., F.Z.S., V.P., in the Chair.

Extracts were read from a letter addressed to the Secretary by Mr. E. L. Layard, F.Z.S., dated British Consulate, Noumea, March 30th, 1878.

Mr. Layard pointed out that Mr. Gould's *Glycyphila fasciata* (Handb. B. Austr. i. p. 499; B. Austr. iv. tab. 30) was quite a different bird from *G. fasciata* (Forster) of New Caledonia, the latter being nearly half as large again. Mr. Layard proposed to change the name of the Australian species to *G. gouldi*.

Mr. Layard also sent the subjoined note on *Petrœca kleinschmidti* of Finsch:—

"Dr. Finsch has described as new, under the name of *Petroica kleinschmidti*, the little *Petroica* of Fiji (P. Z. S. 1875, p. 643). I wish to point out that this species will not stand, and that the Fijian species is not separable from the Samoan *P. pusilla*, Peale. Dr. Finsch says, 'it differs from *P. pusilla*, Peale, from the Navigators, in lacking the white front and the large white mark on the wing-coverts.' Dr. Finsch's description is evidently taken from a female; and she lacks the white marks, which, however, are very visible in the male.

"I have before me two pairs of Fijian birds (♂ and ♀), and three males from Samoa. Unfortunately one of these, from Mr. Whitmee, is unsexed; the other two are of my own killing: one is a young male, and I have no doubt Mr. Whitmee's bird is also a male; none are in very good plumage, whereas my Fijian birds are in splendid order.

"Now, I can affirm that the males are not to be distinguished one from the other, except that the Fijians are in brighter plumage; so that *P. kleinschmidti* must sink into a synonym of *P. pusilla*, with Peale's description of which (U.S. Expl. Exped. p. 165) it entirely agrees."

Mr. Sclater called the attention of the members present to the unique specimen of his *Felis lanea* (P. Z. S. 1877, p. 532), still living in the Society's menagerie, and read the subjoined extract from a letter of Mr. E. L. Layard, F.Z.S., relating to this animal:—

"It will interest you to know that there is a second specimen of

your *Felis lanea* in the South-African museum, sent from the same place (the Beaufort-West Karras) by the late Arthur V. Jackson, who killed it himself. Unfortunately I received the skin in very bad condition. The ground-colour is much paler than in your plate, almost white.

"Jackson and I thought it an albinism (or rather erythrism) of *F. jubata* (see Catalogue of S. A. Museum, p. 38, No. 82, *Guepparda jubata*, specimen *b*). At p. 39 of the same Catalogue, I remark that we have had notices of a second species of Maned Leopard, with solid spots and with retractile claws, from Natal. The claws of your animal are not shown in Smit's plate. What is their structure?"

On this last point Mr. Sclater stated that, so far as could be told from examination of the living animals, the claws of *Felis lanea* resembled those of *Felis jubata*, being observable when the feet were at rest, and being but slightly extensile.

The existence of a second specimen of the animal in the South-African Museum (of which Mr. R. Trimen had also informed Mr. Sclater) was a fact of great interest.

Mr. Sclater read some Supplementary Notes on the Curassows (Cracidæ), mainly based on specimens which had been received by the Society alive since Mr. Sclater's previous memoir on this subject had been read five years ago.

This paper will be published in the Society's 'Transactions.'

The following papers were read:—

1. On the Squirrels of the Neotropical Region.

By EDWARD R. ALSTON, F.L.S., F.Z.S., &c.

[Received June 3, 1878.]

(Plate XLI.)

No better example of a polymorphic genus can be found than the almost cosmopolitan *Sciurus*. Even our common European Squirrel assumes such phases of coloration in the north, in the east, and among the Alps that the extremes would undoubtedly be considered perfectly distinct species if the intermediate links were not known. The same variability is found to a still greater extent in many of the Oriental species; while the polymorphism of some of the North-American forms was pointed out by Professor Baird more than twenty years ago.[1]

It is only lately that similar critical attention has been given to the Squirrels of the Neotropical Region. Of these no fewer than *fifty-nine* nominal species have been described by various writers. The late Dr. Gray, in 1867, published a "Synopsis of the Species

[1] Mamm. North Amer. pp. 244, 245.



J. Smit lith. Hatchett imp.

SCIURUS PUSILLUS.

of American Squirrels in the Collection of the British Museum"[1], in which he recognized *twenty-nine* Neotropical species as being represented in the national cabinet, *nineteen* of them being described as new. Last year appeared Messrs. Coues and Allen's exhaustive volume of 'Monographs of North-American Rodentia'[2], in which the Squirrels are discussed by the last-named zoologist, who includes the South-American species in his scope. Having had access to considerably larger series of specimens than were available to most previous writers, Mr. Allen was led to reduce the number of valid species of Neotropical Squirrels to ten, with two "subspecies," namely:—

Sciurus carolinensis.	*Sciurus leucops.*
—— ——, var. *yucatanensis.*	—— *æstuans.*
—— *colliæi.*	—— ——, var. *rufo-niger.*
—— *aureigaster.*	—— *tephrogaster.*
—— *boothiæ.*	—— *gerrardi.*
—— *hypopyrrhus.*	—— *variabilis.*

He further remarked that he thought that "on the whole the number of species will, by future investigations, be further reduced rather than increased," and that he had erred in recognizing too many species rather than too few.

No one who is acquainted with Mr. J. A. Allen's recent memoirs on the geographical variation of species, needs to be reminded of his breadth of view and extreme carefulness in comparison; and in the present monograph these qualities are as conspicuous as ever. In it Mr. Allen has done a great service in reducing the complicated synonymy of the South-American Squirrels to some order; and if some of his identifications prove to be erroneous, the fault lies in the often totally insufficient or even misleading descriptions of some previous writers.

Within the last year I have been able to examine in the British Museum and the Museums of Berlin and Paris, the types of no less than *forty-one* nominal species of Neotropical *Sciuri*. In these collections I have also been able to compare much more extensive series of specimens than even Mr. Allen had access to; and, through his kindness, I have examined typical examples of the species recognized by him. This study has led me to accept many of Mr. Allen's identifications (some of which are sufficiently startling at first sight), and in some instances to carry the reduction of species still further; but it has also enabled me to correct a few errors in his synonymy, and to point out a few apparently valid species with which he was not acquainted.

Particularly rich in this group are the Paris and British Museums; and the study of their long suites of specimens leads one irresistibly to conclusions which must appear strange to those who only know the extreme links of the chain. Among other things they

[1] Ann. & Mag. Nat. Hist. 3rd ser. xx. pp. 415–434.
[2] Rep. U.S. Geol. Survey of Territories, vol. xi.

have convinced me that Mr. Allen has laid too much stress on the comparative size of the ears, and length and bushiness of the tail, as distinctive characters. In both these points, as well as in the quality of the pelage, every intermediate stage is often to be found; and I have therefore been obliged to unite Mr. Allen's *S. aureigaster* and *S. leucops*, his *S. boothiæ* and *S. hypopyrrhus*, and his *S. gerrardi* and *S. variabilis*. On the other hand, I have felt obliged to recognize, at least provisionally, the specific rank of *S. stramineus*, *S. griseogenys*, *S. rufo-niger*, and *S. pusillus*, and more doubtfully that of *S. griseoflavus*,—thus raising the number of species from ten to twelve.

In facing the intricate and often baffling problem of distinguishing between "species" and "varieties" in such a protean group, I have endeavoured to act in harmony with Mr. Darwin's directions: "When a naturalist can unite by means of intermediate links any two forms, he treats the one as a variety of the other"[1]. It must be remembered that many of these "varieties" apparently breed true and prevail in certain parts of the range; but all that are here brought together are united by such intergradations that a sufficient series at once convinces one of their identity. It is evident, however, that still more complete material will be required before every point can be regarded as definitely settled.

Before proceeding to remark on the various species[2], I must return my warmest thanks to all who have assisted me in this investigation, especially to Mr. J. A. Allen, Professor A. Milne-Edwards, Dr. Peters, and Dr. Günther.

I. Sciurus carolinensis.

Sciurus carolinensis, Gmelin, Linn. Syst. Nat. i. p. 148 (1788, ex Pennant); Allen, Mon. N.-Am. Rodent, p. 700.

Length of head and body averaging 10 inches; of tail-vertebræ about 8 inches.

Upper parts grey or brownish grey, the middle of the back brownish, a rufous lateral stripe usually present; lower parts white. Tail moderate, washed with white, the hairs yellowish brown or whitish, with narrow black rings, broader black subterminal bands and white tips.

Hab. Southern Canada; Eastern United States; Mexico; Yucatan; Guatemala (?).

Concerning this well-known Nearctic form I can add almost nothing to Mr. Allen's exhaustive account. He distinguishes three geographical races or varieties, of which two, his "var. *carolinensis*" and "var. *yucatanensis*," are found within the Neotropical limits. The former, smaller and browner than the northern *leucotis* race, is apparently the *S. carolinensis* which M. de Saussure records from Mexico[3] and Mr. Tomes from Guatemala[4], and

[1] Origin of Species, 6th ed. p. 36.

[2] The species of which I have been able to examine the types or typical specimens are distinguished in the following pages by an asterisk.

[3] Rev. et Mag. de Zool. 1861. p. 4. [4] Proc. Zool. Soc. 1861. p. 282.

there are specimens from Nuevo Leon in the National Museum at Washington. Mr. Allen's "var. *yucatanensis*" is based on specimens collected at Merida, which agree in their pale coloration, the absence of rufous on their flanks, their small size, and the comparative coarseness of their pelage. He considers that this form is "possibly specifically distinct," but remarks that the Nuevo-Leon examples are fairly intermediate; and, judging from the single typical example which Mr. Allen kindly lent me, I think he was wise in refusing it specific rank, at least for the present.

Of the geographical variations presented by the Grey Squirrel throughout its very extensive range, Mr. Allen observes they consist "mainly in decrease in size southward, and an increase in intensity of coloration, the whitish tips of the hairs of the dorsal surface seen in northern specimens being replaced by yellowish-brown in the southern ones, except in the case of var. *yucatanensis*." The decrease in size as we go southwards is of course strongly in favour of the distinctness of the next species.

II. SCIURUS ARIZONENSIS.

**Sciurus arizonensis*, Coues, Amer. Nat. i. p. 357 (1867).
(*Sciurus colliæi*, Allen, Mon. N.-Am. Rodent, p. 738, nec Richardson.)

Length about 12·50, of tail-vertebræ 11 inches. Upper parts grey, more or less mixed with yellowish-brown, especially along the middle of the back; lower parts pure white. Tail long, very bushy, strongly washed with white, the hairs tawny or fulvous with two narrow and one broader black band, succeeded by a long white tip.

Hab. Arizona; California; Mexico.

Misled by imperfect descriptions and a bad figure of Richardson's type, Mr. Allen has referred the Arizona Squirrel of Dr. Coues to Richardson's *S. colliæi*. He has since kindly intrusted me with a typical example of *S. arizonensis*; and I find that it is quite distinct from *S. colliæi* (which is Mr. Allen's *S. boothiæ*), being much more nearly allied to *S. carolinensis*, from which, however, both Dr. Coues and Mr. Allen consider that it is "thoroughly distinct." The superior size, coloration of the long heavy tail, and absence of a lateral line appear to be constant, but in some specimens in the Paris and British Museums the grey of the upper flanks is not so clear from rufous as in the examples described by Mr. Allen. The example mentioned by that gentleman as having "the lower surface considerably varied with irregular patches and streaks of pale yellowish rufous" gives support to the opinion that furthur material will render it necessary to unite the next species with the present. If so, Dr. Coues's name must be retained, as it has priority over Gray's title.

III. SCIURUS GRISEOFLAVUS.

**Macroxus griseoflavus*, Gray, Ann. & Mag. Nat. Hist. 3rd series, xx. p. 427 (1867).

(*Sciurus leucops*, Allen, Mon. N.-Am. Rodent, p. 753, nec Gray.)

Length (in skin) about 13·50 inches, of tail-vertebræ 10·25 inches. Upper parts nearly uniform yellowish grey, the narrow black rings and minute whitish tips of the hairs merely obscuring the general tint produced by their broad pale-brown median bands; lower parts yellowish red, the hairs in one specimen obscurely ringed with black. Tail bushy, strongly washed with white; the hairs yellowish or pale brown, with two or three narrow and one broader black band succeeded by a long white tip.

Hab. Mexico (?); Guatemala.

Mr. Allen considers Gray's *M. griseoflavus* to be specifically identical with his *M. leucops* (*op. cit.* p. 753); and the original diagnosis certainly seems to give countenance to such a view. The typical specimens (five in number), however, are very different, and in my opinion are closely allied to the last species, of which I suspect it will eventually prove to be a southern race. More specimens, however, are required before they can be united; and provisionally I therefore accept *S. griseoflavus* as a distinct species.

It appears probable that this is Mr. Tomes's *S. ludovicianus* from Guatemala[1]; and a Mexican specimen in the Copenhagen Museum, labelled "*Sc. affinis*, an sp. nov.? Reinh.," does not appear to be separable.

IV. SCIURUS VARIEGATUS.

Sciurus variegatus, Erxleben, Syst. Reg. An. p. 421 (1777, ex Hernandez).

**Sciurus aureogaster*, F. Cuvier, Hist. des Mamm. iii., livr. lix. (1829).

Sciurus leucogaster, F. Cuvier, Suppl. de Buff. i. Mamm. p. 300 (1831).

Sciurus albipes, Wagner, Abh. Bayer. Ak. ii. p. 101 (1837).

Sciurus ferruginiventris, Audubon & Bachman, P. Ac. Philad. 1841, p. 101.

Sciurus varius, Wagner, Suppl. Schreber Säugeth. iii. p. 168 (1843).

Sciurus socialis, Wagner, tom. cit. p. 170.

**Macroxus morio*, Gray, Ann. & Mag. Nat. Hist. 3rd series, xx. p. 424 (1867, nec Wagner).

**Macroxus maurus*, Gray, tom. cit. p. 425.

**Macroxus leucops*, Gray, tom. cit. p. 427.

(*Sciurus aureigaster* et *S. leucops*, Allen, Mon. N.-Am. Rodent. pp. 750, 753.)

Hab. Southern Mexico; Guatemala?

Average length about 10·50 inches, of tail-vertebræ 8·75 inches.

[1] Proc. Zool. Soc. 1861, p. 281.

Upper parts grey or reddish grey, the hairs black, tipped or ringed and tipped with white or red. Pelage somewhat soft, with a good deal of under-fur; lower parts deep red, orange, or white. Tail black, washed with white, the hairs usually rufous at their base, with black rings and white tips.

Under this name I feel myself obliged to bring together two Mexican Squirrels of which typical specimens are very different in appearance. Mr. Allen has kept them separate under the names of *S. aureigaster* and *S. leucops*, remarking that the difference in coloration leaves little doubt of their distinctness, but adding that "more abundant material may show that they are not specifically separable" (*op. cit.* p. 755). The colour-variation is not nearly so great as we shall find it to be in the next species; and after a careful examination of a great number of specimens, especially of the fine series in the Paris Museum, I have been unable to find a single distinctive character which is constant.

Typical specimens of the two forms may be thus described:—

1. The *aureogaster* type. Upper parts dark grey, the hairs black, finely tipped with white. Lower parts deep red, which is usually more or less washed over the grey on the shoulders and flanks.

2. The *leucops* type. Upper parts lighter grey, with a peculiar golden lustre, the hairs being finely ringed with bright rufous and tipped with white; nape and rump more strongly rufous. Lower parts bright red, orange, or white.

Many specimens, however, which have the general appearance of *aureogaster* show the rufous subterminal ring of *leucops* on some part of the dorsal surface; and in others we find the red nape and rump-patches gradually appearing. I am therefore compelled to return to the view long ago expressed by Isidore Geoffroy[1], and to regard them as varieties of the same species.

With regard to distribution, all the specimens which I have seen with authenticated localities are from Mexico; but Mr. Allen mentions one from Guatemala in the Washington Museum. Specimens in the British Museum are labelled as being from Columbia; but there can be little doubt that this is an error. *S. aureogaster* is stated by Prof. Sumichrast (as quoted by Mr. Allen) to be "the common species of *Sciurus* of the tierra caliente of the east coast" of Mexico; and both forms are found in the States of Oaxaca and Tehuantepec.

Turning to the question of synonymy, I must briefly explain why I have retained Erxleben's name for this species. Mr. Allen considers it to apply rather to the next species, but rejects it altogether, on the ground that it is based partly on Buffon's "Coquallin" (*S. niger*, L.), and partly on the "Coztiocotequallin" of Hernandez. It is, however, primarily founded on the latter, Buffon's name being only quoted as a synonym; and Erxleben's diagnosis and description appear to me to be quite characteristic of the *leucops* form of the

[1] Voy. de la Vénus, Zool. pp. 156-163.

present species[1]. By retaining this appropriate name, we are enabled to escape from F. Cuvier's barbarous term *aureogaster*, under which this beautiful animal has laboured in so many works. *S. albipes*, Wagner, afterwards re-named *S. varius* by its describer, is doubtfully referred to the next species by Mr. Allen; but the description, especially the character of the hairs being ringed with red, black, and white, appears to point certainly to identity with Gray's *S. leucops*. Wagner's *S. socialis* also, founded on a single example, seems also to be a synonym of the present species; for the characters of coloration by which he differentiates it from his *S. varius* are quite insufficient, and the small size may, as Mr. Allen suggests, be due to the immaturity of the specimen described.

V. SCIURUS HYPOPYRRHUS.

Sciurus hypopyrrhus, Wagler, Isis, 1831, p. 610.

**Sciurus nigrescens*, Bennett, P. Z. S. 1833, p. 41.

**Sciurus colliæi*, Richardson, Zool. Voy. 'Blossom,' p. 8, pl. i. (1839).

**Sciurus variegatoides*, Ogilby, P. Z. S. 1839, p. 117.

**Sciurus richardsoni*, Gray, Ann. Nat. Hist. x. p. 265 (1842, nec Bachman).

**Sciurus boothiæ*, Gray, List Mamm. Brit. Mus. p. 139 (1843).

**Sciurus griseocaudatus*, Gray, Zool. Voy. 'Sulphur,' p. 34, pl. xiii. (1844).

**Sciurus fuscovariegatus*, Schintz, Syn. Mamm. ii. p. 17 (1845, ex Gray).

**Macroxus adolphei*, Lesson, Desc. de Mamm. &c. p. 141 (1847).

**Macroxus pyladei*, Lesson, tom. cit. p. 142.

**Sciurus dorsalis*, Gray, P. Z. S. 1848, p. 138, pl. vii.

**Sciurus rigidus*, Peters, Monatsb. Ak. Berl. 1863, p. 652.

**Sciurus oculatus*, Peters, tom. cit. p. 653.

**Sciurus intermedius*, Verreaux, ap. Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 421 (1867).

**Macroxus nicoyana*, Gray, tom. cit. p. 423.

**Macroxus melania*, Gray, tom. cit. p. 425.

(*Sciurus boothiæ* et *S. hypopyrrhus*, Allen, Mon. N.-Am. Rodent. pp. 741, 746.)

Hab. Central America, from the Pacific coast of Mexico to the Isthmus of Panama.

Average length about 11·75 inches, of tail-vertebræ 10 inches. Pelage close-lying and rather glossy, with little underfur. Upper parts dark brown or black, often broadly ringed with rufous or white. Lower parts varying from deep red to creamy white, sometimes ringed with black. Tail black, generally washed with white, the hair rufous, pale brown or whitish at their base, with one or two black or brown rings and a white tip.

In uniting all the very variously marked Squirrels the names of which

[1] "*S.* corpore supra nigro, albo et fusco variegato. * * * Magnitudo dupla *S. vulgaris*. Auriculæ imberbes. Corpus supra nigro, albo et fusco variegatum, ventre flavescente. Cauda supra corpus reflexa."

are given above, I have gone beyond Mr. Allen, who divides them into two species under the titles of *S. hypopyrrhus* and *S. boothiæ*. The series of specimens to which he had access left him strongly impressed with their distinctness; but he adds that further material may show that they intergrade. After a careful examination of the large series contained in various Museums, and especially of that at Paris, I am quite convinced that this is the case, and have even grave doubts of the propriety of keeping them distinct from the last species. But as I have not yet found specimens strictly intermediate between *S. variegatus* and *S. hypopyrrhus* in the character of the pelage and the annulation of the fur, it seems best to keep them distinct.

The opinion has been expressed above that the differences in comparative length of tail and ears, on which Mr. Allen lays most weight in separating *S. boothiæ* from *S. hypopyrrhus*, cannot be depended on; and I have been totally unable to detect any constant difference in general stoutness of form or breadth of muzzle. As to colour, the intergradations of the different varieties are quite complete, so that it is often difficult or impossible to say to which a given specimen is to be referred. Each variety, however, has its own type, and seems to predominate in its own immediate locality. The five principal phases known to me may be thus arranged:—

1. The *hypopyrrhus* type. Upper parts dark-grey, the hairs black, ringed with white or pale fulvous. Lower parts either concolorous, with the upper or washed with rufous. To this variety I agree with Mr. Allen in referring Bennett's *S. nigrescens*; and it is to the same form that the description of *Macroxus boothiæ* in Gray's memoir of 1867 refers, although the same author's *Sciurus boothiæ* of 1833 was founded on a young example of the white-bellied *colliæi* phase. The rufous-bellied specimens lead us directly into

2. The *rigidus* type. Upper parts usually marbled with fulvous and black, the hairs being glossy brown or black with a median band of yellowish brown. Lower parts bright rufous (*rigidus*), or varied with rufous and white, either symmetrically (*intermedius*) or asymmetrically (*nicoyanus*). In many specimens, as observed by Mr. Allen, there is a more or less marked tendency to the development of a pale grizzled lateral stripe placed high on the flanks and confining the dark dorsal area to a broad median band. From these we have every gradation into the rufous phase of

3. The *dorsalis* type. Upper parts with the median dorsal area black, flanks and lower parts white, fulvous, or rufous. In many individuals the hairs of the black dorsal area will be found to have concealed rings of white or fulvous; so that we have a further transition into

4. The *colliæi* type. Upper parts much as in the *rigidus* form, but usually less rufous; lower parts white (*colliæi, adolphei*) or pale fulvous (*variegatoides, griseocaudatus, pyladei, oculatus*). Usually the dark coloration of the back is extended onto the shoulders, hips, and limbs; but in others it is confined to the middle of

the back, as in the last phase, while the rufous-bellied phases lead us directly back into the *rigidus* form.

5. The *melania* type. Upper and lower parts uniform glossy dark brown, often with irregular patches of paler brown. This is a very peculiar phase, and I have not yet seen any direct intergradation with the other varieties; but uniformity of coloration is so abnormal among the Squirrels, that it seems impossible to doubt that Mr. Allen is right in regarding it as a melanism. The colour is exactly similar to that of the white-bellied *dorsalis* varieties, in which also the paler apparently faded patches are sometimes seen. It appears to be much rarer than any of the other forms described.

With regard to the synonymy, I may observe that I have been able to examine the types of all the "species" here united, excepting that of *S. hypopyrrhus*, which, however, has been well described by Wagler and Wagner; it appears to be a dark variety without the usual wash of white on the tail. That of *S. nigrescens* only differs in having the fur of the lower parts ringed like that of the back; it agrees well with specimens in the Paris and Berlin Museums. *S. colliæi* and *S. adolphei* are synonyms for the white-bellied form above described, from which I am also unable to distinguish *S. richardsoni* of Gray (not of Bachman), on which both *S. boothiæ* and *S. fuscovariegatus* were founded. *S. variegatoides*, *S. griseocaudatus*, *S. pyladei*, and *S. oculatus* are all intermediate links with more or less fulvous lower parts, leading to the phase with a red or red and white belly, on which the names *S. intermedius*, *S. rigidus*, and *Macroxus nicoyanus* have been bestowed.

Of the geographical distribution of the various races we can only judge from the comparatively few specimens of which the exact localities have been noted. The *hypopyrrhus* phase appears to be the most northern, the *colliæi* to obtain principally along the Pacific slopes, and the *dorsalis* to be the most southern. Each, however, appears to be found along with others in some part. Thus, I have seen specimens of *hypopyrrhus* type from Mexico, Honduras, and Guatemala, of *rigidus* from Guatemala, Nicaragua, and Costa Rica, of *dorsalis* from Nicaragua, Costa Rica, Veragua, and Panama, and of *colliæi* from the west coast of Mexico and Guatemala, Nicaragua, and Costa Rica. The only localities which I know for *S. melania* are Nicaragua and Veragua.

VI. Sciurus stramineus.

Sciurus stramineus, Eydoux & Souleyet, Voy. de 'La Bonite,' Zool. i. p. 37, Atlas, pl. ix. (1841).

**Sciurus nebouxii*, Is. Geoffroy, Voy. de 'La Vénus,' Zool. p. 163, Atlas, pl. xii. (1855).

**Macroxus fraseri*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 430 (1867).

(*Sciurus hypopyrrhus*, Allen, Mon. N.-Am. Rodent. p. 747.)

Hab. Ecuador; Peru.

Average length about 12·50 in., of tail-vertebræ 12·50. Upper parts nearly uniform grizzled grey, rump and lower parts more or

less washed with rufous, the hairs blackish towards their base, with long white fulvous or rufous ends; feet blackish; tail black, washed with rufous and whitish; pelage very sparse and harsh, with almost no under-fur.

This curious Squirrel, which appears to be the sole representative of the genus in Western Peru, is rare in collections; and though the few specimens which have been sent to Europe differ little in colour, they have received the above names. Mr. Allen referred three specimens from Guayaquil to *S. hypopyrrhus* (tom. cit. p. 747); and certainly some varieties of that species bear a strong general resemblance to the present. But so far as can be judged from the small series in the Paris and British Museums, *S. stramineus* seems to be fairly entitled to specific recognition; and intermediate forms are hardly likely to be found, as no similar Squirrel appears to be known from any part of Columbia. It is only fair to Mr. Allen to add, that Gray's description of *M. fraseri* is so imperfect that it is not surprising that the American zoologist should have doubtfully referred it to *S. tephrogaster* (tom. cit. p. 763).

A remarkable peculiarity of this species is its tendency to the development of irregular tufts of pure white hairs, rather longer than the rest of the fur, and sometimes uniting in larger patches. These asymmetrical markings are present in the majority of the individuals examined.

A fine specimen of *S. stramineus* from Ecuador is now living in the Society's Gardens[1].

VII. Sciurus variabilis.

**Sciurus variabilis*, Is. Geoffroy, Mag. de Zool. 1832, pl. iv.

Sciurus langsdorffi, Brandt, Mém. Ac. St. Pétersb. 6e sér. iii. p. 425, (1835).

Sciurus igniventris, Natterer ap. Wagner, Wiegm. Arch. 1842, p. 360.

Sciurus pyrrhonotus, Natterer, loc. cit.

Sciurus tricolor, Pöppig ap. Tschudi, Faun. Peruan. p. 156, pl. xi. (1844–46).

Sciurus morio, Wagner, Abh. Bayer. Ak. v. p. 275 (1850, nec Gray),

**Sciurus gerrardi*, Gray, P. Z. S. 1861, p. 92, pl. xvi.

**Sciurus brunneo-niger*, Castelnau ap. Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 429 (1867).

**Sciurus fumigatus*, Gray, tom. cit. p. 428 (1867).

(*Sciurus gerrardi* et *S. variabilis*, Allen, Mon. N.-Amer. Rodent. pp. 766, 768.)

Hab. Panama; Venezuela; Columbia; Ecuador; Peru; Brazil; Bolivia.

Average length about 12 inches, of tail-vertebræ 11 inches. Upper parts red, either pure or more or less grizzled with black, lower parts white, fulvous, or light rufous, sharply defined from the dorsal colour-

[1] See above, p. 441.

ing; tail black, washed with bright-red orange, often very bushy. Pelage rather harsh and sparse, ears high and narrow.

Here, again, the greater amount of material at my disposal compels me to go beyond Mr. Allen in the identification of nominal species. Most of the above synonyms were brought together by him under the name of *S. variabilis*; but *S. gerrardi* and *S. rufo-niger* were kept separate under the former title. The principal points on which he rested were the smaller size and shorter ears of *S. gerrardi*; but on examination of a sufficient series, I have not been able to find any constancy in the proportions of the ears, while the difference in size totally disappears, as is shown by the following series of measurements—9·50, 9·75, 10·00, 10·25, 10·75, 11, 11·50, 11·75, 12·00, 12·75, 13·00. The smaller specimens (*S. variabilis*, *S. gerrardi*, &c.) appear to prevail towards the north: but this is not constant; for a Santa-Martha example measures over 12 inches, while others from Brazil are under 10 in., although evidently adult. Nor is it constantly connected with any of the numerous varieties of coloration—rufous, grizzled, and melanistic specimens occurring of all sizes.

The range of these variations of colour is not nearly so great as in *S. hypopyrrhus*; and they seem to resolve themselves into three primary groups, namely:—

1. The *morio* type. Upper and lower parts black, only slightly ringed with rufous or fulvous, tail black, either entirely or slightly washed with red. Of this melanistic form no two specimens agree exactly in the proportion of red; and every step is present leading into

2. The *variabilis* type. Upper parts red, more or less varied with black—but the rufous tint prevailing, especially on the flanks; lower parts pure white, fulvous, or pale rufous; tail (either narrow or bushy) black, strongly washed with bright rufous or orange. Here we have an endless series of minor variations, from the very brilliant black and red specimens sent from the Rio Napo to the British Museum, and the bright rufous Columbian form, through more and more greyish red specimens, till we find ourselves in

3. The *langsdorffi* type. Upper parts reddish or yellowish grizzled, the hairs being pretty uniformly ringed with black and red or black and yellow; lower parts and tail as in the last.

Each of these styles appears to prevail in certain localities: thus the melanistic form has been found on the Upper Amazons by Mr. Bates and by Castelnau and Deville, the rufous type on the Rio Negro and Rio Madeira by Natterer, and the grizzled in North-western Brazil by Spix. But there seems to be no regularity in their distribution; and I have seen both grizzled and red specimens from Panama, Venezuela, Columbia, and North-eastern Peru.

The oldest name, and therefore the one here adopted, is *S. variabilis*, given in 1832 by Isidore Geoffroy to small red specimens from Columbia, and strictly synonymous with Gray's *S. gerrardi*; while *S. igniventris* and *S. pyrrhonotus* were MS. names of Natterer's, applied by Wagner to other varieties of the rufous type. *S. langs-*

dorffi and *S. tricolor* both refer to the forms in which the upper parts are more or less uniformly grizzled; while *S. morio*, *S. rufo-niger*, and *M. fumigatus*, are all more or less melanistic varieties.

VIII. SCIURUS GRISEOGENYS.

**Sciurus æstuans*, var. *hoffmanni*, Peters, Monatsb. Ak. Berl. 1863, p. 654.

**Sciurus hyporrhodus*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 419 (1867).

**Macroxus xanthotus*, Gray, tom. cit. p. 429.

**Macroxus griseogenu*, Gray, tom. cit. p. 429.

(*Sciurus æstuans*, var. *rufo-niger*, Allen, Mon. N.-Am. Rodent. p. 757.)

Hab. Ecuador; Columbia; Venezuela; Panama; Veragua; Costa Rica; Nicaragua.

Length about 9 inches, of tail-vertebræ 8 inches. One upper premolar. Upper parts dark olive, the hairs dusky, very minutely annulated with rufous or fulvous; lower parts bright orange or rufous; tail black, more or less washed with bright red or deep orange, the hairs reddish brown banded with black and tipped more or less broadly with rufous.

Mr. Allen, in his monograph, regards this Squirrel as a "variety" or geographical race of the next species, differing in its uniformly larger size and strikingly in the coloration of its tail. In a subsequent letter to me, he says:—"It would perhaps be just as well to recognize it as entitled to specific rank, although I still feel sure of their intergradation." That such connecting links may yet be found seems very probable; but I have not been able to find such in the very large series which I have examined, and am consequently compelled to keep them provisionally distinct.

Unfortunately Mr. Allen has identified this species with Pucheran's *S. rufo-niger*, which, as will be seen presently, is a much smaller and quite distinct species[1]. Dr. Peters described it only as a variety of *S. æstuans*; and though specimens in the Berlin Museum are labelled "*Sciurus hoffmanni*," the name remains a manuscript one. Of Gray's three titles I have adopted *griseogena* (more correctly *griseogenys*) as being simultaneous in date with the others, and as indicating the typical form. His *S. hyporrhodus* is founded on an example from Santa Fé de Bogotá, and is characterized by its long soft fur and hairy ears, peculiarities easily explained when we remember that that city stands at an elevation of over 8800 feet, and is overlooked by lofty mountains. *Macroxus xanthotus* is undoubtedly an immature animal, as is proved by the dentition of the type specimen. By some curious error Gray's account of this last has been printed after that of *M. brunneo-niger*, instead of after *M. griseogena*; so that the remark, "very like the former" &c., naturally led Mr. Allen to refer the synonym to *S. gerrardi*.

S. griseogenys varies very little in colour: in some examples the

[1] *Cf. infrà*, p. 669.

middle of the back is considerably darker than the flanks; and there is some variety in the exact tint of the red wash on the tail. I can confirm Mr. Allen's statement that this species (as well as *S. variabilis* and *S. æstuans*) have normally only one upper premolar. Dr. Peters states, it is true, that the type of his "var. *hoffmanni*" had two; but the first was minute and only attached to the gum; and I have not been able to find more than one, either in dried skulls or in spirit-specimens.

IX. Sciurus æstuans.

Sciurus æstuans, Linnæus, Syst. Nat. i. p. 88 (1766).

Myoxus guerlingus, Shaw, Gen. Zool. ii. p. 171, pl. clvi. (1801).

Sciurus gilvigularis, Natterer ap. Wagner, Abh. Bayer. Ak. v. p. 283 (1850).

**Macroxus leucogaster*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 430 (1867, nec F. Cuv.).

**Macroxus irroratus*, Gray, tom. cit. p. 431.

**Macroxus flaviventris*, Castelnau ap. Gray, tom. cit. p. 432.

(*Sciurus æstuans*, var. *æstuans*, Allen, Mon. N.-Am. Rodent. p. 756, 1877).

Hab. Guiana; Brazil; Eastern Peru; Bolivia.

Average length about 7·25 inches, of tail-vertebræ 7 inches. One upper premolar. Upper parts olive, rather lighter and more fulvous than in the last species; lower parts fulvous, greyish, or white; tail black, more or less washed with pale fulvous, the hairs pale brown, banded with black and tipped with pale faded yellow.

I have little to add to Mr. Allen's critical notes on this well-known Squirrel. Gray states, in his description of his *M. leucogaster* (not to be confounded with F. Cuvier's species of that name[1]), that the hairs of the lower parts are "white to the base;" this is not the case, though the dusky colour at the roots is little developed on the chest. *M. irroratus* must also be placed here, although the original description is such that Mr. Allen unhesitatingly referred it to the last species; and *M. flaviventer* is to me quite undistinguishable from the ordinary type of *S. æstuans*. *S. pusillus*, Geoffr., and *Macrotus kuhlii*, Gr., are considered by Mr. Allen to be the young of the present species; but I believe them to be quite distinct[2].

X. Sciurus deppei.

**Sciurus deppei*, Peters, Monatsb. Ak. Berl. 1863, p. 654.

**Macroxus tephrogaster*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 431.

**Macroxus tæniurus*, Gray, loc. cit.

**Macroxus medellinensis*, Gray, op. cit. ser. 4, x. p. 408 (1872).

(*Sciurus tephrogaster*, Allen, Mon. N.-Am. Rodent. p. 763 (1877)).

Hab. Mexico; Honduras; Guatemala; Columbia.

Average length nearly 9 inches, of tail-vertebræ 7·25 inches. Two upper premolars. Upper parts dark olive, often darker along the

[1] *Cf. anteà*, p. 660.

[2] *Cf. infrà*, p. 670.

middle of the back; lower parts white, greyish white, or light fulvous; tail black, lightly washed with white, the hairs fulvous, with black bands and short pure white tips.

Mr. Allen was led to admit the specific validity of this Squirrel, on finding that it differed from the last two in having normally two well-developed upper premolars; and the specimens which I have been able to examine confirm his observation. He failed, however, to recognize this species in Dr. Peters's description of his *S. deppei*, which he doubtfully referred to the southern form of *S. carolinensis*[1]. An examination of the types of *S. deppei*, *M. tephrogaster*, *M. tæniurus* and *M. medellinensis* convinces me that they are all strictly synonymous, the species presenting but little variation in coloration. In *S. deppei* and *M. tæniurus* the lower parts are washed with fulvous; in *M. tephrogaster* they are greyish white; while the types of *M. medellinensis* are smaller and have the middle of the back nearly black, exactly as in many specimens of *S. griseogenys*. Intermediate examples occur; and the whole range of variation between the extremes is comparatively trifling.

As already observed[2], *M. fraseri*, Gr., was so insufficiently described that Mr. Allen was led to identify it with the present species, which is about half its size and totally different in coloration.

XI. Sciurus rufo-niger.

**Sciurus rufo-niger*, Pucheran, Rev. de Zool. 1845, p. 336.
**Sciurus chrysosurus*, Pucheran, tom. cit. p. 337.
**Macroxus tephrogaster minor*, Gray, MS. (Mus. Brit.).

Hab. Columbia; Panama; Veragua.

Average length about 5·50 inches, of tail-vertebræ 3·75 inches. Two upper premolars. Upper parts dark olive, the hairs very minutely tipped with fulvous; breast bright rufous, rest of lower parts like the upper, but paler; tail nearly uniform with the back, the hairs reddish fulvous, barred with black and minutely tipped with pale yellow or white.

On examining the type of Pucheran's *S. rufo-niger* in the Paris Museum, I found that it was not identical with *S. griseogenys*, as Mr. Allen supposed, but rather allied to *S. deppei*; and I soon recognized in it a small Squirrel of which I had seen several specimens from Panama, and which I had begun to fear would require a new name. These examples prove to agree further with *S. deppei* in having two upper premolars, but differ in being more than one third smaller, in the colour of the lower parts (which are only paler than the upper, save on the breast), and in the tail being nearly uniform in colour with the back (the hairs having only very minute white or yellow tips). Specimens in the British Museum are labelled *M. tephrogaster minor*; but I cannot doubt the distinctness of the form. The type of *S. rufoniger* has the middle of the back nearly black; while that of *M. chrysosurus* appears to be a variety, merely differing in the tail being more rufous.

[1] *Tom. cit.* p. 710.

[2] *Cf. antea*, p. 665.

XII. SCIURUS PUSILLUS. (Plate XLI.)

Sciurus pusillus, Geoffroy apud Desmarest, Mamm. p. 337, pl. lxxvii. fig. 2 (1820).

**Macroxus kuhlii*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 433 (1867).

Hab. Guiana; Brazil.

Length about 4·50 inches, of tail-vertebræ 3 inches. Two upper premolars. Upper parts greyish olive, the hairs dusky, very minutely tipped with pale fulvous; lower parts only slightly paler; tail black, washed with whitish or pale yellow.

I was not able to ascertain the type of Geoffroy's *S. pusillus* in the Paris Museum; but there can hardly be a doubt of its identity with specimens standing under that name in the British museum, and with the types of Gray's *Macroxus kuhlii*. All these are supposed by Mr. Allen to be merely very young individuals of *S. æstuans*[1], in spite of Buffon's observations on the development of the reproductive organs in the type of *S. pusillus*[2]. The British-Museum specimens, however, agree in size with Buffon's and Desmarest's descriptions, and are not yet quite adult, as shown by their skulls and teeth; moreover the two specimens examined differ from *S. æstuans* in the possession of two upper premolars. Their very small size and the nearly uniform greyish olive of both their upper and lower parts prevent their being confounded with any other species known to me. The type of *M. kuhlii*, collected in Brazil by Castelnau, merely differs in having a white spot at the root of each ear, and in the extreme tips of the hairs of the tail being white instead of pale fulvous.

2. On a third Collection of Birds made by the Rev. G. Brown, C.M.Z.S., in the Duke-of-York Group of Islands and its vicinity. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 11, 1878.]

(Plate XLII.)

I have now the pleasure of submitting to the Society a third[3] collection of birds made by our Corresponding Member the Rev. J. Brown, in the group of islands known generally as the Duke-of-York Islands, and on the adjacent islands of New Britain and New Ireland.

The collection was forwarded from Port Hunter, the missionary station in the Duke-of-York group, on the 24th of February last by a small trading-steamer bound for Hongkong. It contains a series

[1] *Tom. cit.* p. 759. [2] Hist. Nat. Suppl. vii. p. 264.

[3] For notices of two previous collections, see P. Z. S. 1877, p. 96, and 1878, p. 289.

P.Z.S. 1873. PLXIII.



CARPOPHAGA MELANOCHROA.

of birds obtained while coasting along in a boat amongst the islands of the group. In a letter of the same date Mr. Brown states that he was hoping to be able shortly to spend a week at Spacious Bay or some other place in New Britain, where he would be able to make a more extensive collection.

The present collection contains thirty-five skins referable to thirty species. The exact localities being marked in every case, I think it advisable to give a perfect list of the species. "Duke-of-York group" means one of the group of twelve islands which form together the land marked in our chart "Duke-of-York Island"[1].

		See P. Z. S.	Locality.	Date.
1.	Cisticola ruficeps	1877, p. 98	Duke-of-York group.	1, '78
2.	Sauloprocta melaleuca	„ 99	„ „	11, '77
3.	Rhipidura setosa	„ 99	„ „	
4.	Monarcha verticalis	„ 99	„ „	
5.	—— chrysomelas	„ 100	New Ireland.	
6.	—— alecto	„ 100	Duke-of-York group.	
7.	—— inornatus	.....	„ „	
8.	Artamus insignis	„ 101	Spacious Bay, N. B.	1, '78
9.	Edoliosoma, sp. inc. (♀)	„ 101	New Ireland.	11, '77
10.	Lalage karu	„ 101	Duke-of-York group.	
11.	Dicranostreptus megarhynchus	„ 101	New Ireland.	
12.	Gracula kreffti	„ 104	Duke-of-York group.	
13.	Alcedo moluccensis	„ 105	„ „	11, '77
14.	Halcyon albicilla	„ 105	„ „	
15.	Buceros ruficollis	.....	Spacious Bay, N.B.	
16.	Eurystomus crassirostris	„ 106	Duke-of-York group.	10, '77
17.	Centropus ateralbus	„ 106	New Ireland.	
18.	Cacomantis insperatus	„ 106	Duke-of-York group.	
19.	Eudynamis picatus	„ 106	„ „	
20.	Geoffroius heteroclitus	.....	New Ireland.	
21.	—— cyaniceps	„ 106	New Britain.	
22.	Trichoglossus subplacens	„ 108	Duke-of-York group.	10, '77
23.	Carpophaga rubricera	„ 109	„ „	
24.	—— vanwycki	„ 109	„ „	
25.	—— melanochroa, sp. nov.	.....	„ „	
26.	Œdirhinus insolitus	„ 110	„ „	10, '77
27.	Macropygia browni	„ 110	„ „	
28.	Chalcophaps stephani	„ 111	„ „	
29.	Nycticorax caledonicus	.....	„ „	
30.	Megapodius eremita	„ 113	New Ireland.	

I now give some notes on the species new to the locality, or on which I have additional information to offer.

4. MONARCHA VERTICALIS, Scl. P. Z. S. 1877, p. 99, pl. xiv. fig. 1.

A second specimen of this interesting species has an oblong white spot at the extremity of the outer rectrix on both sides.

[1] *Cf.* footnote, P. Z. S. 1877, p. 98.

7. MONARCHA INORNATUS (Garnot); Scl. P. Z. S. 1877, p. 552.

This bird has not occurred in the former collections of Mr. Brown, but is a well-known and rather widely extended Papuan species.

15. BUCEROS RUFICOLLIS, Vieill.; Temm. Pl. Col. 577; Scl. P. Z. S. 1869, p. 122.

Apparently an adult female of this Hornbill from Spacious Bay, New Britain.

20. GEOFFROIUS HETEROCLITUS.

Psittacus heteroclitus, Hombr. et Jacq. Ann. Sc. Nat. xvi. p. 319.
Pionus heteroclitus, id. Voy. au P. S. Atl. t. 25 bis (♂).
Pione heteroclitus, Puch. ibid. Zool. iii. p. 103.

A fine male of this species from New Ireland agrees with the original figure and description of that sex. One of the Solomon-Islands skins referred to, P. Z. S. 1869, p. 122, appears to be the female of this species, the other to belong to the next.

21. GEOFFROIUS CYANICEPS, Pucheran.

A skin from New Britain marked "*male*," which has had the wings cut away, and has apparently been in a cage, is probably of the same species as that previously referred (P. Z. S. 1877, p. 107) to *Geoffroius cyaniceps*. This is decidedly smaller than *G. heteroclitus*, and has the top of the head of a pale greenish grey with the sides yellowish.

Dr. Salvadori, who examined the specimen in the previous collection of Mr. Brown, remarks that it comes very near the female of *G. simplex*, Müller. A better series of this bird is necessary before it can be made out decidedly.

25. CARPOPHAGA MELANOCHROA, sp. nov. (Plate XLII.)

Nigricanti-ardesiaca fere unicolor, alis cauda et dorso inferiore in plumbeum transeuntibus; alarum tectricibus omnibus marginibus angustissimis albis præditis; subalaribus et crisso castaneo tinctis; rostro nigro; pedibus purpureo-rubris.

Long. tota 15·5, alæ 9·5, caudæ rectr. med. 6·0, ext. 5·5.

Hab. Ins. Duke of York.

This fine Fruit-pigeon is quite new to me, and, I believe, undescribed, though I am not acquainted with *C. pistrinaria*, Bp.[1], of the Solomon Islands, to the neighbourhood of which it would appear to belong.

Mr. Brown's single specimen is marked "male; eyes bright scarlet; legs purple." As will be seen from the measurements, the tail is slightly rounded; there are fourteen rectrices, as is always, I believe, the case in *Carpophaga*. The under-surface of the tail is rather ashy white, that of the wings greyish black.

The uniform dark colour, varied only by the very narrow margins of the wing-coverts, will render this species easily recognizable.

[1] Consp. Av. ii. p. 36.

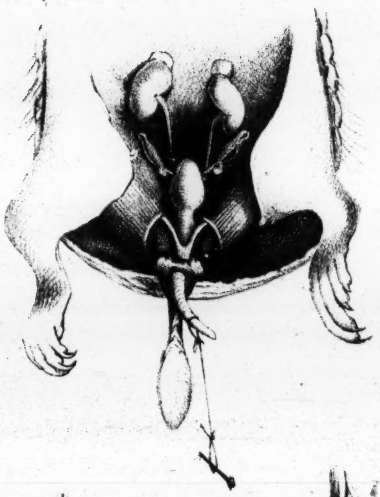


Fig. 1.



Fig. 4.



Fig. 3.

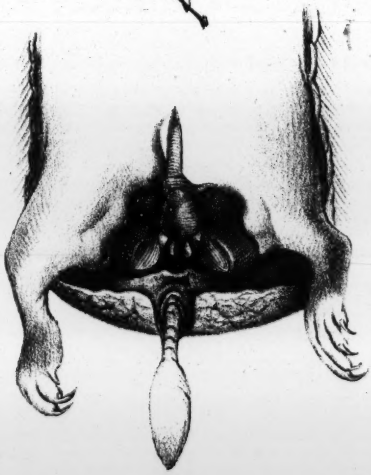


Fig. 2.



Fig. 5.

A.H.Young MB del

J.Smit Lith

ANATOMY OF CHLAMYDOPHORUS TRUNCATUS.

27. MACROPYGIA BROWNI, Scl. P. Z. S. 1877, p. 110.

I am glad to receive a second example of this fine species from the Duke-of-York group.

Dr. Salvadori writes me that he suspects that *Turacœna crassirostris*, Gould (P. Z. S. 1856, p. 136), may be the young of *Macropygia browni*. I have examined Mr. Gould's typical specimen of the former species now in the British Museum; but although I believe it is, no doubt, the young of an allied species of *Macropygia*, I do not think it can belong to *M. browni*, as it is so much smaller in size.

29. NYCTOCORAX CALEDONICUS (Gm.); Gould, Handb. B. Austr. ii. p. 311.

An adult of this Night-Heron from the Duke-of-York group is marked:—"Irides yellow; legs dusky reddish pink; bare space about eyes lavender.—G. B."

30. MEGAPODIUS EREMITA.

Megapodius eremita, Hartl. P. Z. S. 1867, p. 830.

M. hueskeri, Cab. et Reich. J. f. O. 1876, p. 326; Scl. P. Z. S. 1877, p. 113.

M. rubrifrons, Scl. P. Z. S. 1877, p. 556.

Prof. Salvadori has recently examined the typical specimens of *M. eremita* from the Echiquier Islands, *M. hueskeri* from New Hanover, and *M. rubrifrons* from Admiralty Island, and pronounces them to be identical.

3. On the Male Generative Organs of *Chlamydophorus truncatus* and *Dasypus sexcinctus*. By M. WATSON, M.D., Professor of Anatomy, Owens College, Manchester.

[Received June 11, 1878.]

(Plate XLIII.)

1. CHLAMYDOPHORUS TRUNCATUS.

The anatomy of *Chlamydophorus truncatus* has formed the subject of elaborate monographs by Hyrtl[1], Macalister[2], and others[3]; and little remains to be said regarding such parts of the animal as have been fully investigated by these anatomists. On looking over their essays, however, I find that, with regard to the male generative organs, we possess almost no reliable information. Professor Hyrtl's specimen was a female; and although that anatomized by Professor Macalister was of the opposite sex, his reference to the male organs is sufficiently meagre to justify me in giving a detailed description of these from two male specimens of this rare mammal which have lately come into my hands.

[1] Denkschriften der kais. Akad. Wien, ix. 1855.
[2] Trans. Roy. Irish Acad. 1875, p. 219.
[3] Harlan, Lond. Zool. Journ. 1825; Atkinson, Journ. of Anatomy, vol. v.

The specimen measured 4½ inches in length, exclusive of the tail.

Penis.—The penis is large for the size of the animal, and, so far as one can judge from the examination of specimens preserved in alcohol, appears, in the natural condition, to be strongly curved, the convexity of the curve being directed forward, whilst the extremity of the penis is directed downward and backward toward the anus. The organ is slender, and tapers gradually from base to apex, measuring $\frac{5}{8}$ of an inch in length and $\frac{1}{16}$ of an inch in diameter. The base is surrounded by a small prepuce consisting of little more than a narrow ring of integument, and is entirely destitute of a frenum præputii. The presence of two powerful retractores penis, however, justifies us in concluding that in the *Chlamydophorus*, as in *Dasypus sexcinctus*, the penis is, in the flaccid condition, retracted within this apparently rudimentary prepuce. The intermediate portion of the penis presents an appearance of irregularly disposed circular constrictions, apparently due to the annulated character of the integument, and corresponding exactly to that described below in the six-banded Armadillo. The glans penis is not distinguishable as a separate portion from the rest of the organ; and the absence of it, together with that of the bulb, would appear to indicate that a corpus spongiosum is altogether wanting, as it apparently is in the Armadillo, the penis in that animal being formed exclusively by the two corpora cavernosa. I could not distinguish any patch of transverse ridges on the ventral aspect of the organ, such as is seen in that of *Dasypus sexcinctus*; but the small size of the parts, combined with their immersion in alcohol, may have obliterated these (under any circumstances) very minute elevations.

Internal Organs.

Kidney.—The kidneys are large in comparison with the size of the animal, and are situated in the lumbar region. Each is almost globular in form, measuring $\frac{3}{8}$ of an inch in length and $\frac{2}{8}$ in breadth, and is surmounted by a suprarenal capsule of large size and pyramidal form. The ureter measures $\frac{9}{16}$ of an inch in length, and enters the bladder close to the orifice of the urethra, being crossed on its inner side from before backward by the corresponding vas deferens.

Bladder.—The bladder, globular in form, small, and provided with walls of considerable thickness, lies altogether in front of the transverse ligament which unites the two pubic bones together, and which corresponds in position to the pubic portion of the brim of the pelvis in the majority of mammals. The viscus is partly invested by peritoneum, which forms a well-marked inferior ligament attaching it to the middle line of the anterior abdominal wall. In the specimen examined the bladder was contracted, and measured $\frac{1}{4}$ of an inch in length and the same in greatest breadth. The urethral orifice is on a level with the base of the viscus.

Urethra.—The urethra is divisible into two portions—an intrapelvic or muscular, and an extrapelvic or spongy portion. The intrapelvic portion, from the neck of the bladder to the point of entrance of the Cowperian ducts, measures $\frac{3}{16}$ of an inch in length. Its

walls are thick, being surrounded by a layer of circularly disposed muscular fibres. Resting upon the upper surface of the proximal half of this portion of the urethra is the prostate gland, the posterior border of which is attached to the tube. On slitting open the canal, no trace of a vesicula prostatica could be distinguished; but it is well to bear in mind that the small size of the parts, together with the immersion of these for some time in alcohol, may have served to prevent the recognition of what, under any circumstances, must be a very minute organ. Professor Macalister[1] refers to the presence of a Weberian organ, of which, however, he gives no description, merely stating that it is "long, and not distinctly bifid;" but inasmuch as he makes no mention of a prostate gland, it appears to me to be not improbable that he may have mistaken that gland for the organ in question, an error which need occasion no surprise when the small size of the parts is taken into consideration. If the Weberian organ be present, it certainly does not project beyond the wall of the urethra. The extrapelvic or spongy portion of the urethra lies within the penis and measures $\frac{1}{8}$ of an inch in length. At its commencement it receives the ducts of Cowper's glands, whilst at its termination it opens upon the summit of the rounded extremity of the penis.

Testicles and vasa deferentia.—Professor Macalister[2] states that the testicles lie within the "wide abdominal ends of the inguinal canals;" but this was certainly not the case in my specimen. In it the testicles were situated immediately posterior to the kidneys, and in close relation to the superior abdominal wall, to which each was closely attached through the reflection of the peritoneum. The testicle of the right side was posterior in position to that of the left. The gland itself was of the same size and form as a canary-seed, and, together with the epididymis, measured $\frac{1}{4}$ of an inch in length. The latter was of large size as compared with the testicle, to the outer side of which it was attached at both its anterior and posterior extremities. The anterior extremity, or globus major, is continuous with the testicle, the separation between them being indicated by a slight constriction. From this it passes forward for $\frac{1}{16}$ of an inch, and, suddenly curving upon itself, turns backward to the same extent, and becomes constricted to form the body of the epididymis. The latter extends along the outer side of the testicle as far as its posterior extremity, where it again expands into a glandular mass, or globus minor, which, however, is of larger size than both limbs together of the globus major. From this body the vas deferens passes off. The entire testicular mass is placed obliquely, its anterior extremity being directed obliquely forward and outward, the posterior, which is in contact with the lateral aspect of the apex of the bladder, in the opposite direction. The vas deferens measures $\frac{1}{8}$ of an inch in length, and crosses the ureter in its course backward. The two vasa at their termination are almost in contact, and disappear from view by sinking into the anterior border of the prostate gland, the substance of which they traverse in their course to the

[1] *Loc. cit.* [2] *Loc. cit.*

urethra. As Professor Macalister observes, the vasa are not convoluted, neither do they present any trace of lateral diverticula or vesiculæ seminales.

Prostate gland is well developed, and forms a quadrilateral mass of lobulated glandular tissue lying upon the upper surface of the intrapelvic urethra. It measures $\frac{1}{8}$ of an inch in length, and the same in breadth, and is attached by its posterior border to the urethra, its anterior border, which is free, extending between the vesical openings of the ureters. The vasa deferentia sink into the latter in their course to the urethra. Prof. Macalister does not refer to this gland.

Cowper's glands.—These, which are not mentioned by Macalister, are two in number. Each lies in close relation to, and slightly under cover of, the inner side of the crus penis. They are regularly pyriform; and each measurss $\frac{1}{16}$ of an inch in length. Their ducts pass forward, and open at once into the commencement of the spongy portion of the urethra.

Penis.—The penis is formed by the junction of the two crura exclusively, the third element or corpus spongiosum being entirely absent. The crus penis of each side is attached to the ramus of the ischium, as well as to the posterior half of the free border of the pubic bone, the latter bone not uniting with its fellow of the opposite side. Each measures $\frac{1}{2}$ an inch in length, and lies along the inner side of the adductor muscle of the thigh. The two crura unite opposite the anterior border of the pubic bones, and together form, as it were, a bridge, underneath which the rectum passes backward to the anus. In consequence of the absence of a corpus spongiosum, the penis is devoid of both bulb and glans. The penis itself measures $\frac{1}{8}$ of an inch in length, of which the basal $\frac{3}{5}$ are concealed by the integument, the remainder being free.

Muscles of penis.—Of these there are three on each side of the middle line:—(1) The *ischio-cavernosus* is strong and covers the crus. Its fibres are attached posteriorly to the ischium, whilst anteriorly they are inserted into the crus behind the junction of the latter with its fellow. A small portion of the crus between this and the next muscle is uncovered by muscular fibres. (2) *Bulbo-cavernosi.* These two muscles are apparently continuous across the middle line, and together form an investment of transversely arranged muscular fibres which covers the lower surface of the basal portion of the penis. No median raphé could be distinguished between them. (3) *Retractores penis.* These are placed on the dorsal aspect of the organ. Each is a delicate riband-like muscle which, arising from the upper wall of the pelvic cavity, crosses the outer side of the depressor caudæ muscle, and passing down parallel to the crus penis, and along the dorsal aspect of that organ, is inserted into the corpus cavernosum immediately behind the tip of the penis. These muscles doubtless act in the same manner as in *Dasypus*, and serve to retract the penis within the rudimentary prepuce. Beyond the statement that the crus penis is invested by muscular fibres, Prof. Macalister gives no account of the muscles just described.

2. Dasypus sexcinctus.

If now we compare the male organs of *Chlamydophorus* with those of *Dasypus sexcinctus*, we shall find that the resemblance between them is very striking. A full description of the male organs of *D. sexcinctus* after that already given of those of *Chlamydophorus truncatus* would be superfluous, seeing that the one would to a large extent be a mere repetition of the other; and I shall therefore confine myself to the indication of some points of interest in the anatomy of *Dasypus* which appear to have been overlooked[1]. The penis is enormous, and in a specimen measuring 13 inches in length, exclusive of the tail, is 4 inches long. It closely resembles that of *Chlamydophorus* in form, its extremity being simple and not bifid as in the allied genus *Tatusia*. The integumental covering of the penis is annulated in character, the annulation extending from the base to the extremity of the organ on its dorsal or abdominal aspect, but interrupted on its lower surface toward the tip of the organ by a cutaneous patch presenting an altogether different appearance. This patch, which is situated immediately behind the extremity of the penis, is oval in form, and measures $1\frac{1}{4}$ inch in length. It surface is characterized by the presence of numerous closely placed transverse ridges of a hard and corneous nature. These ridges give to the patch somewhat of the appearance of a fine file, and, in the absence of a distinct glans, in all probability fulfil the function of the recurved spines so frequently seen on the latter in many mammals. The prepuce is very small, and, when the penis is fully extended, disappears entirely, being stretched so as to form the cutaneous covering of the latter. In the flaccid condition, however, and when the organ is retracted, the penis is withdrawn entirely within the prepuce and almost concealed from view. Improbable as it may appear that an organ of the length of the penis can be really retracted within so small a prepuce, I am in a position to know that such is the case, having examined two specimens, in one of which the penis was exserted, as in fig. 4, whilst in the other it occupied the position shown in fig. 5. The retraction is accomplished by two retractor muscles, which, arising from the lower surface and outer border of the sacrum, pass forward along the whole length of the dorsum penis even to the tip, fibres being inserted into every part of that surface. These muscles, which exactly repeat those of *Chlamydophorus*, when contracting, have the effect of throwing the penis into a series of spiral curves, its extremity being bent inwards, as shown in fig. 5, so as to complete the concealment of the organ under its sheath. That these muscles are really the agents in producing this retraction is proved by the fact that the *concavity* of the terminal curve of the penis is formed by the *dorsal* aspect of the organ, on which these muscles are placed, whilst the *convexity* of the curve is formed by its *ventral* surface which is readily distinguished by the presence of the file-like patch already referred to. The penis is formed, as in *Chlamydophorus*,

[1] I have been unable to consult Prof. Alexandrini's monograph of *Dasypus*, in Mem. Accad. d. Sci. Bologna, tom. vii. 1856.

by the junction of the two crura alone, and possesses neither bulb nor glans. With regard to the other muscles of the penis, these closely resemble those already described in *Chlamydophorus*, with this difference, that the single mass formed by the bulbo-cavernosi muscles in the latter are here represented by two distinct and powerful fleshy bands which envelop the under surface of each crus previous to its junction with its fellow. The testicle differs in position in *Dasypus* from that which it occupies in *Chlamydophorus*, being attached to the inguinal region of the *anterior* abdominal wall in the former, whilst in the latter it lies behind the kidney. The globus major in *Dasypus* is closely applied to the anterior extremity of the testicle, and does not form the loop-like arrangement seen in *Chlamydophorus*. The vasa deferentia in both are non-convoluted; nor is there any trace of vesiculæ seminales in either. In both, a prostate and Cowper's glands are present, the former being traversed by the vasa deferentia in their course to the urethra, whilst the latter, although occupying the same position, are relatively considerably smaller in *Dasypus* than in *Chlamydophorus*. The bladder and urethra are similar in both genera, the only difference being that the walls of the intrapelvic portion of the latter are much more muscular in *Chlamydophorus* than in *Dasypus*, and that in the latter a well-marked caput gallinaginis, of a pyramidal form, is present, which is not represented in the former. In neither is there any trace of a vesicula prostatica.

It will thus be seen that in respect of the male sexual organs the resemblance between *Chlamydophorus* and *Dasypus sexcinctus* is very striking—a resemblance which, in respect of other organs, has been already pointed out by Prof Garrod[1]. As shown by that anatomist, *Chlamydophorus* agrees also with *Tolypeutes* and *Xenurus* in the absence of vesiculæ seminales and the simple condition of the glans penis, in both of which respects it differs from *Tatusia*. The presence of Cowper's glands constitutes a further element of agreement between *Chlamydophorus* on the one hand, and *Dasypus* and *Xenurus* on the other. These glands are also present, according to Dr. Murie[2], in *Tolypeutes*; but whether in *Tatusia* I cannot say, as with regard to the latter we possess no precise information. So far, then, as the observations above recorded go, they tend to strengthen the conclusions already arrived at by Mr. Garrod upon other grounds with regard to the close relationship which exists between *Chlamydophorus* and *Dasypus*. Professor Macalister, as the result of his elaborate investigation into the muscular anatomy of the Edentata, arrives at the conclusion that "the position of *Chlamydophorus* will be seen ..... to be plainly among the Dasypodidæ, and very close to *Tatusia*." The arrangement, however, of the sexual organs, including the nipples, together with that of the alimentary canal, which in *Dasypus* and *Chlamydophorus* is provided with two colic cæca, these last being absent in the other genera above referred to[3], appear rather to point to a closer relationship between *Chla-*

[1] P. Z. S. 1878, p. 222.
[2] Trans. Linn. Soc. vol. xxx.
[3] See Prof. Garrod's paper.

mydophorus and *Dasypus* than between *Chlamydophorus* and *Tatusia*.

I am indebted to Dr. Young for the preparation of the accompanying illustrations.

EXPLANATION OF PLATE XLIII.

Fig. 1. Male generative and urinary organs of *Chlamydophorus truncatus*, seen from the front. From above downwards are seen the suprarenal capsules, the kidneys and ureters, the testicles, the bladder and urethra, and the penis. The penis is hooked back to show the retractor muscles on its dorsal aspect.

2. Male organs of *Chlamydophorus truncatus*, perineal view. From above downwards are seen:—the penis, its basal portion being covered by the fibres of the bulbo-cavernosi muscles; below this the Cowperian glands lying in the interspace between the crura penis, these last being covered by the fibres of the ischio-cavernosi muscles.

3. Male organs of *Chlamydophorus* dissected, and seen from behind. K, kidney and suprarenal capsule; T, testicle; P, prostate gland; C, Cowper's gland; Pe, penis; C *p*, crus penis.

4. Penis of *Dasypus sexcinctus*, showing the file-like structure on the lower aspect of its extremity.

5. Penis of *Dasypus sexcinctus* retracted within the prepuce.

4. Note on Points in the Anatomy of Levaillant's Darter (*Plotus levaillanti*). By A. H. Garrod, M.A., F.R.S.

[Received June 14, 1878.]

In a former communication[1] I had the opportunity of bringing before the Society several facts with reference to the anatomy of *Plotus anhinga*, and of confirming Mr. Macgillivray's account of its most peculiar proventriculus. Several specimens of the species have since passed through my hands which differ in no way from that first described.

On the 9th of March last the Society obtained for the first time, by purchase, a male specimen of Levaillant's Darter (*Plotus levaillanti*) from Senegal. It unfortunately died on the 7th of this month (May) from peritonitis, the result of a perforating ulcer in the stomach.

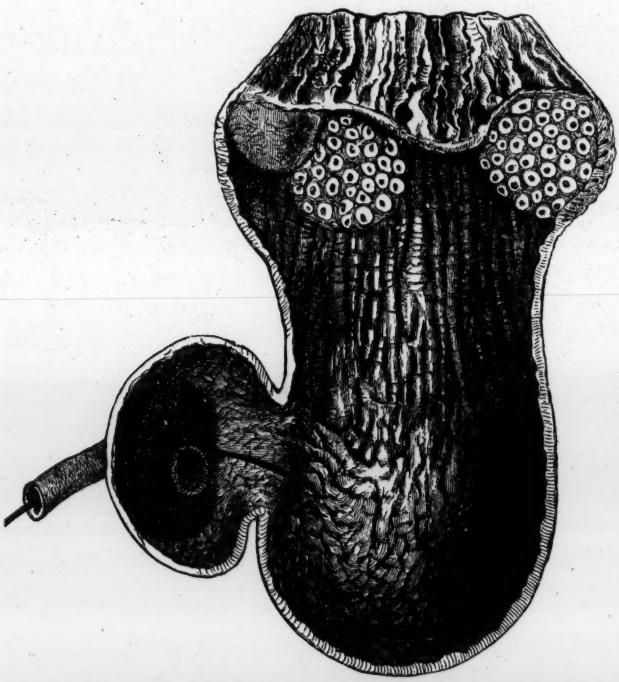
The severity of the peritonitis caused all the abdominal viscera to be agglutinated into a single mass, and rendered them particularly soft. Nevertheless I was able to disentangle most of the alimentary canal for examination; and it has proved of more than ordinary interest, as the following description will serve to show.

The tongue, as a free organ, is obsolete. The œsophagus is capacious, without any crop. The œsophageal epithelium ceases abruptly by a transverse line where the gastric portion of the canal commences, below which it is replaced by the tough yellow epithelium so characteristic of the situation.

The proventriculus is composed of two circular areas of deep glands, which latter are of considerable size and do not come into con-

[1] P. Z. S. 1876, p. 335.

tact, being situated laterally upon opposite sides of the gullet. These areas are flat, except at their upper margins, where a small transverse ridge is developed, which may be the slight foreshadowing of the special cavity developed in *Plotus anhinga* for the reception of the secretion of the gastric glands. But in *P. levaillanti* it is to be noticed that there are two gland-surfaces, whilst in *P. anhinga* it will be remembered there is but one gland-cavity.



View of the inner surface of the posterior wall of the stomach of *Plotus levaillanti*, with the œsophagus slit up anteriorly so as to show the whole of its proventricular surface, with the two gland-areas and the U-shaped elevation on its anterior wall (on the left of the figure), as well as the pyloric infundibuliform plug.

The calibre of the œsophagus must be somewhat diminished by the presence of a curious U-shaped ridge upon the mucous membrane of its anterior wall, which is situated between the antero-lateral margins of the gland-areas, and has a small pit in the part

corresponding to the surface between the limbs of the U, apparently not glandular in nature. All these structures are covered with the tough gastric epithelium, which ceases just above them.

The first true gastric cavity is larger than the second, though not much so. In the second the peculiar hairy covering of its pyloric portion is largely developed, and in a different manner from what it is in *P. anhinga*, where, as I have shown in my paper on the anatomy of that bird, it forms a kind of sieve to prevent large solid particles from entering the duodenum. In *P. levaillanti* a more elaborate arrangement obtains; the hairy epithelium surrounding the pyloric orifice, near the lower margin of the gastric surface of which it is developed, is produced into a considerable conical hair-covered process, projecting into the second stomach, and evidently acting as a valve to close the pylorus when necessary. In general appearance it much resembles the operculum of the Cheilostomatous Polyzoa, and is very striking at first sight, the hirsute conical plug when retracted, fitting exactly into the equally hirsute conical pyloric end of the second stomach-cavity. All the rest of the second stomach is lined with a non-hirsute epithelium, which ceases abruptly where it meets the hairy surface. I can find no trace of this operculum in *Plotus anhinga*, upon re-examination.

The small intestine measured two feet, and the large three inches; but they may have been contracted by the inflammation of their surfaces. Two minute cæca were clearly seen, one a little larger than the other. In *P. anhinga* there is no indication of a second cæcum.

As in *P. anhinga*, *P. levaillainti* possesses but one carotid artery, the left. In their myology the two species agree in every respect, as far as I can see. In *P. levaillanti* the ambiens is large, grooving the patella, the femoro-caudal is present without an accessorius, as is the semitendinosus. There is a slip from the biceps of the arm, which traverses the patagium; and the temporal muscles run back beyond the skull, being separated by a median fibrous raphé, which is *not* ossified into a separate bony style. The great pectoral muscle is formed of two layers.

Donitz's bridge is ossified, as in the specimen described by the author after whom it is named: it is developed on the ninth, and not on the eighth cervical vertebra, as I predicted would be the case.

The lower larynx is indistinguishable from that of *P. anhinga*.

It is interesting to notice that the Manatee and Dugong have special gastric gland-structures, the method of arrangement of which differs in exactly the same way as does that of the two species of *Plotus* under consideration, the peculiar flat gland-area found in *Halicore* and *Plotus levaillanti* being converted into a glandular cavity in *Manatus* and *Plotus anhinga*.

5. On the Gravid Uterus and Placenta of *Hyomoschus aquaticus*. By Professors A. H. Garrod, M.A., F.R.S., and William Turner, M.B., F.R.S.

[Received June 11, 1878.]

(Plate XLIV.)

An adult female of *Hyomoschus aquaticus* having come into our hands, it was with no small pleasure that on eviscerating it we found it far advanced in pregnancy; for it enables us to give an account of the placenta, the nature of which has, till now, only been surmised from what is found in *Tragulus*.

In his valuable memoir on the Tragulidæ[1], M. Alphonse Milne-Edwards briefly describes and also figures the fœtus with the placenta of *Tragulus stanleyanus*. He makes no mention of the uterus, of which, in an allied species, John Hunter tells us[2] that it "soon divides into two horns, which are pretty large and not long, having none of the buttons for the cotyledons."

In his paper on the visceral anatomy of *Hyomoschus aquaticus*[3], Prof. Flower describes the female generative organs in the following words:—"The vagina was 5 inches in length; the uterus 3·5 inches to the point of bifurcation, sharply bent back on itself near the upper end, and terminated in a pair of rather short, closely curled cornua."

In our gravid specimen the single hairless fœtus which, from tip of nose to end of tail, measures 8·5 inches, the tail being an inch long, is lodged on the left side.

The uterus consists of two horns communicating with a common corpus uteri. The horns are united together in the greater part of their extent, not more than about 1·5 inch of the tip of each horn being free. The line of union is marked externally by a groove, and internally by a broad partition, the septum uteri, which extends longitudinally backwards and terminates in a well-defined semilunar free border, behind which the two horns are fused together into the common corpus uteri. The free ends of the cornua are curled backwards, and together with the Fallopian tubes and ovaries are situated upon the anterior part of the superior wall of the uterus. Owing to the fœtus being developed in the left horn, this cornu is much more dilated than the right; but the latter is considerably more capacious than in the non-gravid uterus. The corpus uteri communicates by a constricted os with a passage which may perhaps be regarded as a cervix, though some might look on it as only the specially modified anterior end of the vagina. This part of the genital passage is $1\frac{3}{4}$ inch long and very much constricted. Its mucous lining is longitudinally folded; and the folds are at intervals so projecting as to give the appearance of transverse constrictions. The passage and the os

[1] Annales des Sciences Naturelles, 5th series, vol. ii. 1864, pp. 49-167.
[2] 'Essays and Observations,' edited by Prof. Owen, 1861, vol. ii. p. 135.
[3] P. Z. S. 1867, p. 960.

Fig 1.

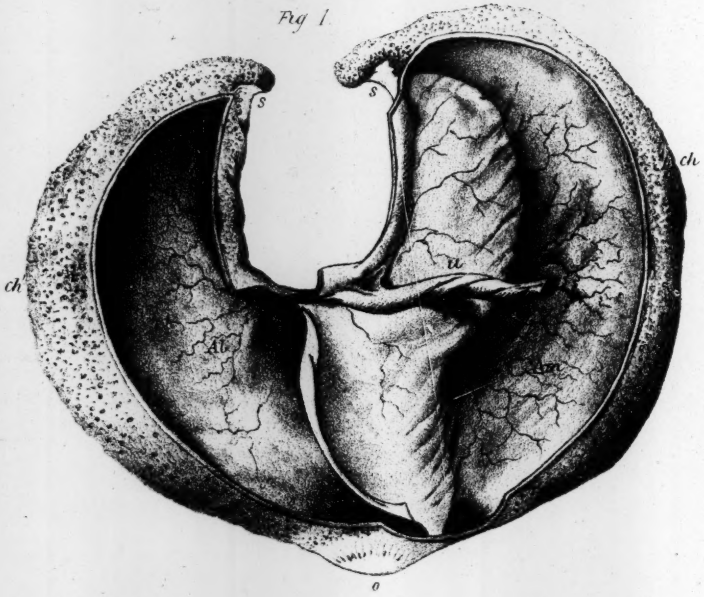
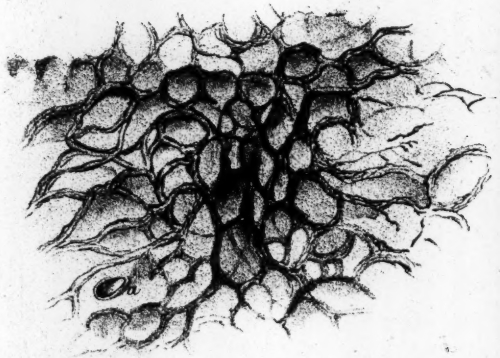


Fig 2.



J. Smit, lith.

M. & N. Hanhart, imp.

ANATOMY OF HYOMOSCHUS

are blocked up by a whitish viscid mucus. Behind the most posterior transverse constriction the vagina undergoes a considerable dilatation, and the mucous lining exhibits faint longitudinal folds.

The uterine walls are slightly thinner than those of the human stomach. The cavity of the two cornua and of the corpus uteri is lined by a well-defined mucous membrane, from which the fœtal chorion can readily be separated. This mucous membrane forms the maternal portion of the diffused placenta characteristic of *Hyomoschus*. The mucosa of both cornua is not elevated into folds, except in close proximity to the openings of the corresponding Fallopian tubes; and the mucous lining of the corpus uteri is longitudinally folded only in proximity to the os uteri. The free surface of the mucous membrane, both in the cornua and corpus and on both surfaces of the septum uteri, is soft and velvety and pitted with multitudes of minute depressions just visible to the naked eye. These depressions are the crypts in which the villi of the chorion are lodged when the chorion is *in situ*. The crypts are distributed with almost equal regularity over the surface of the mucosa in the several divisions of the uterus; but on the more convex part of the impregnated left cornu the mucosa is not quite so thick, so that the crypts are shallower, and over a limited area the free surface of the mucous membrane is almost, if not quite, free from crypts. We did not, however, see any depressed circumscribed smooth areas surrounded by crypts such as one of us has described elsewhere[1] in the Pig and Lemurs, or polygonal areas occupied by crypts and bounded by ridges free from crypts, such as are to be seen in the gravid uterus of the mare. In the regular diffusion of the crypts over the surface of the mucosa, the gravid uterus of *Hyomoschus* much more closely resembled what has been described in *Orca gladiator*[2] than it did the uterine mucosa of the Pig, Mare, and Lemurs.

We then carefully stripped portions of the mucous membrane off the subjacent muscular coat, and soaked them in glycerine for some days, in order to render the membrane as translucent as possible. When the mucosa thus prepared was examined microscopically, the openings of the uterine glands on the surface of the membrane could be seen. Sometimes these openings were found on the slender raised folds of mucosa separating adjacent crypts from each other; at other times they opened into the crypts, and at other times on smoother portions of the membrane where the crypts were shallower or almost absent; but in no case were the mouths of the glands specially localized in smooth circumscribed areas of the mucosa, as is the case in the Pig and in the Lemurs. The gland-orifices were directed obliquely to the plane of the free surface of the membrane; and it was not uncommon to see an epithelial plug projecting through the mouth.

Additional views of the relation of the glands to the crypts were obtained by making vertical sections through the mucosa. This

[1] Turner, Lectures "On the Comparative Anatomy of the Placenta," Edinburgh, 1876, and Trans. Roy. Soc. London, 1876.

[2] Turner, Trans. Roy. Soc. Edinburgh, 1871.

membrane consisted of a gland layer and a crypt layer. The gland layer was next the muscular coat, and consisted of elongated tubular glands, somewhat tortuous and occasionally bifurcating. In the vertical sections the glands were cut across so that the tubes were sometimes transversely, at others obliquely, at others longitudinally divided, and here and there the stem of a gland could be seen passing obliquely through the crypt-layer to open on the surface in the manner already described. The glands were lined by a columnar epithelium, and possessed a central lumen. The glands were neither so numerous nor so distinct, neither did they bifurcate so frequently as do the utricular glands in the Pig and the Cetacea.

The crypt layer contained the numerous depressions already referred to for the lodgment of the villi of the chorion. The epithelium lining the crypts had, as a rule, disappeared; so that it was only in exceptional localities that it could be seen *in situ*, where it appeared to consist of cells, the type form of which was columnar, though modifications of that shape occurred. The subepithelial connective tissue contained a large proportion of corpuscles, some of which were fusiform, others polygonal, others of the rounded form of white blood-corpuscles. This tissue was more compact where it formed the walls of the crypts; but deeper in the mucosa, as it approached the glandular layer and the muscular coat, it had an areolated character. The vessels of the uterus were not injected; but there can be no doubt that, if they had been so, the walls of the crypts would have been seen to contain an abundant freely anastomosing network of capillaries, such as exist in the corresponding crypts in the Cetacea, the Mare, the Pig, and the Lemurs. In sections through the wall of the uterus, that had been stained with hæmatoxylin, a well-defined band, coloured with the blue pigment, marked the junction of the deep surface of the mucous membrane and its glands with the muscular coat. This band in all probability was the muscularis mucosæ. In *Hyomoschus*, as in other animals possessing a diffused placenta, the uterine glands have no relation, as regards numbers or termination, to the crypts. The crypts are infinitely more numerous than the glands, and are not to be regarded as formed by a dilatation of their mouths, but are new formations during pregnancy, due to hypertrophy and folding of the mucous membrane so as closely to adapt it to the irregular villous surface of the fœtal chorion.

The chorion extended from the tip of the left uterine cornu, through the corpus uteri, to the tip of the right uterine cornu. The left horn of the chorion, which contained the fœtus, was longer and much more capacious than the right horn. The tip of each horn of the chorion was in close relation to the orifice of each Fallopian tube; and close to the tip the free surface of the chorion was over a very limited area smooth and non-villous. That part of the chorion situated in the corpus uteri, immediately opposite the os uteri, presented a circular non-villous surface about the size of a shilling. This surface, though without villi, was folded so as to adapt it to the corresponding folds of the uterine mucosa in the same locality. A portion of

the chorion corresponding to the more convex part of the gravid uterine cornu was thinly covered with villi, and, indeed, in one or two very limited areas was non-villous—these bare or thinly covered patches being in contact with those portions of the uterine mucosa (already described) where the crypts are either shallow or absent. In all other localities the free surface of the chorion was as thickly studded with villi as the uterine mucosa was with crypts; so that it furnished an excellent and characteristic example of a diffused placenta. In the absence of villi from those parts of the chorion which were situated in relation to the three uterine orifices, *i. e.* the os uteri and the two Fallopian tubes, the chorion of *Hyomoschus* corresponded with what one of us has elsewhere described in *Orca*, the Narwhal, and the Mare.

The villi were arranged in small tufts, separated from each other by very narrow intervals. The tufts varied in size; and the villi of which they were composed were short and branched, usually in the form of filamentous processes. The basal substance of each villus and of the chorion itself consisted of a delicate corpusculated connective tissue. The epithelium on the free surface of the chorion was partly shed; but considerable patches of it were seen in many localities.

The amnion formed a capacious bag, which extended to within half an inch of the tip of the left horn of the chorion. It occupied the rest of this horn and the part of the chorion situated in the corpus uteri, but did not extend into the right horn of the chorion.

The sac of the allantois occupied the whole of the right horn of the chorion, extending as far as its tip; and its wall was in close apposition by its attached surface with the deep surface of the chorion. The sac of the allantois was also prolonged into the left horn of the chorion to within half an inch of its tip: but in other respects its distribution in this horn was limited; for instead of being in contact with the whole extent of the deep surface of the chorion, it formed only a circumscribed tubular prolongation attached to that part of the chorion which was opposite the belly of the fœtus. The remaining part of the deep surface of the chorion in this horn was in contact with the attached surface of the amnion, which membrane extended as far as the edge of the non-villous circular spot opposite the os uteri. The amnion was also prolonged over the tubular prolongation of the allantois which extended into this horn. The amnion enveloped the umbilical cord up to the abdominal wall of the fœtus. The amniotic investment of the cord was studded with numbers of small stunted whitish sessile corpuscles, which did not, however, project from the free surface of the amnion, where it was in contact with the chorion and allantois. These bodies resembled in form and size the bodies projecting from the umbilical cord in the Cetacea. They had not, however, the yellowish-brown colour of the corresponding corpuscles in *Orca* and the Narwhal, but like them they were developed in relation to the deep surface of the amnion and caused an elevation of that membrane by their growth.

The umbilical cord was $3\frac{1}{4}$ inches long. It contained two arteries and two veins; and a slender tubular prolongation of the sac of the

allantois could just be traced into the chorionic end of the cord. Some injection was passed into the vessels of the cord, which filled the principal vessels of the chorion; but as the specimen had been for some time in spirit before the injection was made, it did not enter the vessels of the villi. Slender vessels, however, traversed the non-villous spot opposite the os uteri, and some also were seen subjacent to the amnion where it was in contact with the wall of the tubular prolongation of the allantois situated in the left horn of the chorion.

EXPLANATION OF PLATE XLIV.

Fig. 1. Fœtal membranes of *Hyomoschus aquaticus*, opened into and fœtus removed; reduced from natural size. *Ch.* Villous chorion of the fœtal horn. *Ch*^{1}. Villous chorion of the opposite horn. *Al.* Sac of allantois in the non-fecundated cornu, the communication of which with the tubular prolongation in the fœtal horn is seen to the right of the letters. *Am.* Sac of the amnion; the letters are placed on the amnion where it is in contact with the chorion. *U.* The umbilical cord; the letter is placed on the amnion where it is in contact with the allantois. *o.* The non-villous surface of the chorion opposite the os uteri. *S. S.* The smooth non-villous parts of the chorion in relation to the Fallopian tubes.

2. Magnified view of the free surface of the uterine mucous membrane of *Hyomoschus*, showing the crypts in which the villi of the chorion are lodged. At *a* the mouth of one of the uterine glands is shown.

The drawings have been kindly made for us by Mr. J. D. Dunlop.

6. Descriptions of new Asiatic Hesperidæ.

By F. Moore, Assistant Curator, India Museum, London.

[Received June 11, 1878.]

(Plate XLV.)

Ismene subfasciata, n. sp.

Male. Upperside dark velvety umber-brown; costal edge of fore wing slightly ochreous; cilia of both wings ochreous. Underside paler: fore wing with a pale pink triangular costal patch before the apex; posterior border ochreous, adorned with a large hairy tuft: hind wing with a transverse pink fascia across middle of the wing. Eyes red. Legs beneath and anal tuft ochreous.

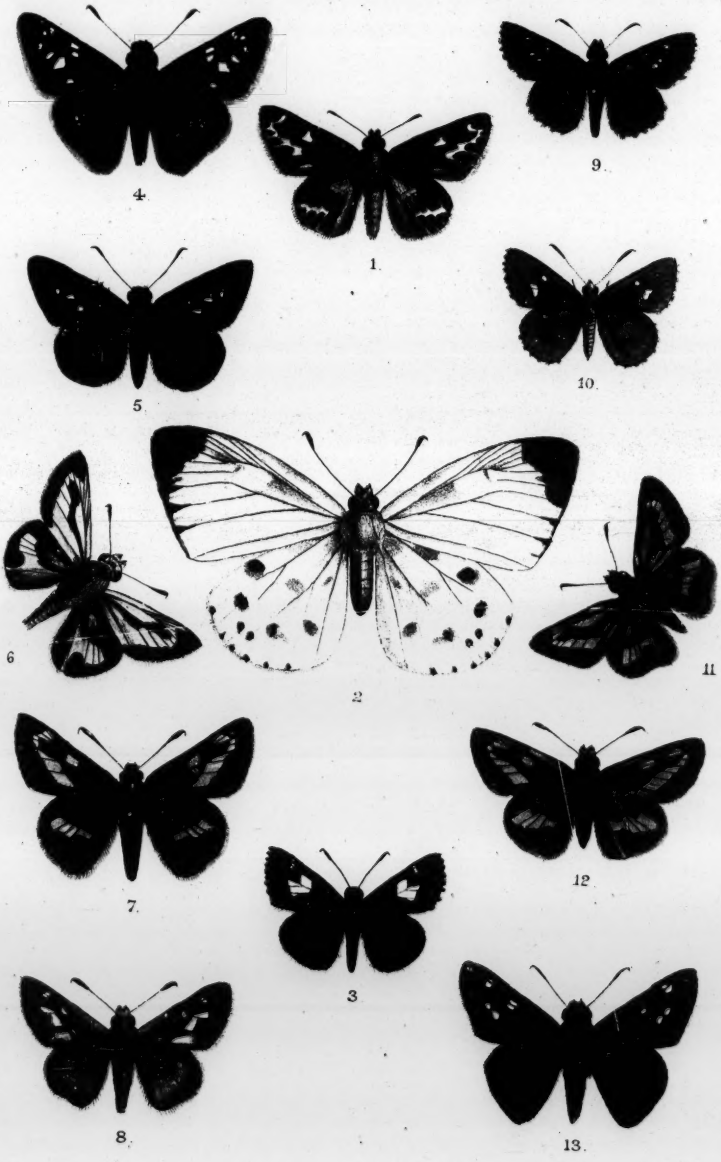
Expanse 2 inches.

Hab. Ceylon (*In coll. Sir W. H. Gregory and Dr. Thwaites*).

Allied to *I. aria*, Moore, from which it may be distinguished by the markings on the underside.

Calliana, n. g.

Wings ample, broad. Fore wing trigonal; cell long, broad; costal vein extending to one third from apex; subcostal vein curved at end of the cell, first, second, third, and fourth branches arising at equal distances before end of cell, fifth from its end, the three former ter-



NEW ASIATIC HESPERIDÆ.

Mintern Bros. lith.

minating before the apex, fourth at the apex, and fifth below it; discocellulars angled close to the upper end; upper radial from the angle, lower from their middle; median vein three-branched, widely apart, the upper from lower end of cell, middle and lower branches at equal distances, the lower from near base of cell; submedian slightly recurved. Hind wing broadly ovate; subcostal two-branched, second before end of cell; discocellulars slightly angled; radial from their angle; median three-branched, middle branch from immediately before end of cell. Body small, robust, abdomen short. Palpi short, thick, pilose, ascending, third joint short, conical. Antennæ slender. Legs pilose.

CALLIANA PIERIDOIDES, n. sp. (Plate XLV. fig. 2.)

Male. Upperside creamy-white, glossy; fore wing with the apex broadly vinous-brown, the end of the median veins also with a vinous-brown-speckled spot: hind wing with a curved upper discal decreasing series of five purple-black spots, the upper one large and situated between the costal and subcostal veins; the end of the veins also with a small vinous-brown-speckled spot. Underside white; fore wing with the costal base, a patch beyond end of the cell, and the outer border pale vinous-brown: hind wing with a short black narrow streak at end of costal border, four large subbasal and a curved discal series of seven purple-black spots, a marginal series of broad vinous-brown spots, one at end of each vein. Thorax and abdomen white; collar, top of head, palpi, and tip of abdomen pale ferruginous; tip of palpi and antennæ black; legs pale ferruginous above, purple-brown beneath.

Expanse $2\frac{5}{8}$ inches.

Hab. ? N.E. Bengal (*A. Grote*). In coll. F. Moore.

HESPERIA NAROOA, n. sp. (Plate XLV. fig. 4.)

Male and Female. Upperside dark olive-brown: fore wing with two prominent semidiaphanous yellowish well-separated spots at end of the cell, a subapical series of three smaller spots, and an oblique discal series of five spots: hind wing with two very small discal spots in male, three in female. Underside dark olive-brown; fore wing marked as above: hind wing with a prominent white spot at upper end of the cell, and a curved discal series of four spots. Body olive-green.

Expanse $1\frac{9}{12}$ inch.

Hab. Bombay (*Wilkinson*); Ceylon (*Mackwood*). In coll. F. Moore and F. M. Mackwood.

Allied to *H. contigua*, Mabille; markings similar, but both sexes one third less in size.

HESPERIA KUMARA.

Hesperia kumara, Moore, Catal. Lep. E.I.C. i. p. 255 (1857).

Female. Upperside dark olive-brown; fore wing with a transverse discal series of seven yellowish semidiaphanous spots from before the apex; cilia pale brownish-yellow. Underside deep ochreous-brown:

fore wing marked as above, the lowest spot being yellow: hind wing with a single discal indistinct yellow spot between the two lower median branches. Palpi and body brown; tarsi ochreous.

Expanse $1\frac{5}{8}$ inch.

Hab. Canara (*S. N. Ward*). In coll. India Museum, London.

This species is also found in Ceylon, the male differing from the female above and beneath in the first upper and lowest discal spots being obsolete.

HESPERIA SERIATA, n. sp.

Allied to *H. kumara*. Male differs from the same sex of that species in the discal row of spots being slightly smaller, and in having an additional lower small spot (which is present only in the female of *H. kumara*). Underside greenish brown; fore wing marked as above, the lowest spot suffused.

Expanse $1\frac{5}{8}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

HESPERIA BEVANI, n. sp.

Male. Upperside dark olive-brown; cilia pale brownish-cinereous; fore wing with a single small, pale white, semidiaphanous spot at upper end of the cell, three contiguous subapical spots, another below these, and two larger spots below obliquely on the disk, a small spot also very indistinctly visible on middle of submedian vein: hind wing without spots. Underside greyish olive-brown; spots slightly more prominent than above: hind wing with a discal series of five small somewhat indistinct white spots.

Expanse $1\frac{2}{8}$ inch.

Hab. Salween, Moulmain (*Lieut. Bevan*). In coll. F. Moore.

A male specimen of this species from Calcutta, collected by the late Mr. Atkinson, is in the collection of Dr. O. Staudinger.

HESPERIA BADA, n. sp.

Allied to *H. mangala*.

Male and Female. Upperside dark brown, base of wings olive-brown; cilia pale cinereous-brown: fore wing with two (in some specimens three) contiguous subapical small white semidiaphanous spots, and three spots below obliquely on the disk, the upper one the smallest: hind wing with a discal irregular linear series of three or four white semidiaphanous spots, more or less indistinct. Underside greyish-brown; both wings marked as above, the spots on the hind wing being more prominent.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{10}$ inch.

Hab. Ceylon. In coll. F. Moore.

Also in the collection of Dr. O. Staudinger from Malacca.

HESPERIA FARRI, n. sp.

Male and Female. Upperside ferruginous-brown, base of both wings olive-brown; cilia yellowish-cinereous: fore wing with two pale yellow semidiaphanous spots at end of the cell, and a discal recurved

series of seven spots, the four upper and the seventh smallest, the upper three being contiguous and obliquely before the apex, the sixth below end of the cell and the largest. Underside greyer-brown in the female: fore wing marked as in male, except that the lowest spot is more diffused: hind wing without spots.

Expanse, ♂ $1\frac{4}{8}$, ♂ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Farr*); Cherra Punji (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

Hesperia toona, n. sp.

Allied to *H. eltola*, Hewits. Exot. Butt. Hesp. pl. 4. f. 40.

Male. Differs in the fore wings being slightly more elongate, the hind wing more convex exteriorly, and the anal angle less lobed; markings above similar, those on the fore wing narrower, the spot between the median branches elongated and extending to their basal angle; those on the hind wing very small, the outer spot crossed by a vein. Underside brownish-ochreous; base of fore wing slightly dusky-ochreous; markings as above.

Expanse $1\frac{6}{12}$ inch.

Hab. N.E. Bengal (*A. Grote*). In coll. F. Moore.

Hesperia subgrisea, n. sp. (Plate XLV. fig. 5.)

Allied to *H. gremius*, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 271, pl. 3. f. 7).

Male. Differs above in having the three oblique discal spots smaller, the lowest appearing only as a few greenish-grey scales, the upper subapical series of two and a single spot at upper end of the cell very minute. Underside less grey in colour, the fore wing marked as above; hind wing with an indistinct black cell-spot and a discal series of spots.

Expanse $1\frac{4}{8}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

Pithauria, n. g.

Fore wing elongated, narrow; apex pointed; exterior margin very oblique; hind margin short; hind wing convex externally, lobular at anal angle. Head and thorax very broad, robust; abdomen not so long as hind wing. Antennæ with a slender club and very long whip-like tip. Venation similar to *Pamphila*.

Pithauria murdava. (Plate XLV. fig. 13.)

Hesperia murdava, Moore, P. Z. S. 1865, p. 784.

Hab. Darjiling.

Halpe, n. g.

Allied to *Pamphila* (*P. sylvanus*). Antennæ with a more slender club and longer hook at tip. Fore wing shorter; exterior margin more convex; the discal oblique series of raised scales in male shorter and broader. Head and thorax smaller; abdomen slender. Veins similar, the lower median branch being nearer end of the cell.

HALPE CEYLONICA, n. sp. (Plate XLV. fig. 9.)

Upperside dark brown; base of wings and body olive-brown; fore wing with two contiguous subapical small white spots, two oblique discal small conical spots with deeply excavated outer border, and a smaller spot at upper end of the cell; the male with an oblique discal streak composed of broad raised darker brown scales; cilia brownish-cinereous, alternated with dark brown. Underside dark brown, speckled with ochreous scales; fore wing with white spots as above, and a small spot also below the discal series; an upper submarginal row of indistinct pale ochreous spots; hind wing with a broad transverse median and a maculated discal greyish-ochreous band. Palpi, body beneath, and legs greyish-ochreous.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{5}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

HALPE BETURIA.

Hesperia beturia, Hewitson, Descr. Hesp. p. 36 (1868).

Hab. Calcutta district (*Atkinson and Farr*); Andamans (*Roepstorff*).

HALPE LUTEISQUAMA.

Pamphila luteisquama, Mabille.

Hab. Luzon.

HALPE DOLOPIA.

Hesperia dolopia, Hewitson, Descr. Hesp. p. 27 (1868); Exot. Butt. Hesp. pl. 6. f. 60, 61.

Hab. Darjiling (*Atkinson*).

HALPE RADIANS, n. sp. (Plate XLV. fig. 1.)

Male. Upperside luteous-brown, basal hairy scales yellow. Cilia cinereous-white: fore wing with a pale yellow constricted spot at end of the cell, and an irregular transverse continuous discal band of spots with their lower angles continued outward along the veins; hind wing with a yellow streak at end of the cell, and a short discal band with outer rays. Underside paler, minutely speckled with yellowish-white; fore wing as above, the hind margin being also broadly yellow; hind wing with a subbasal spot, all the veins, and two (a median and a discal) transverse sinuous bands pale yellow. Palpi, body beneath, and legs yellowish-white.

Expanse $1\frac{1}{2}$ inch.

Hab. Dhurmsala, N.W. Himalaya. In coll. F. Moore.

PAMPHILA PALMARUM, n. sp. (Plate XLV. figs. 6 & 7, ♀ ♂.)

Differs from typical Java specimens of *P. augias*, Linn., in its much larger size, the *male* having the markings above paler yellow and broader, the impressed oblique discal streak on the fore wing being obsolete, the outer border of the discal band much less sinuous, and the yellow colour not extending along the veins to the exterior margin of the wing.

Female. Paler brown above, the yellow bands on the upperside also paler, less prominent, and there being no yellow along the costal border of fore wing, and no median streak from base of the hind wing. Underside pale vinous-brown, this colour pervading the upper portion of the discal on the fore wing and the entire discal band on the hind wing.

Expanse, ♂ $1\frac{4}{8}$, ♀ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Grote and Atkinson*). In coll. F. Moore and Dr. Staudinger.

"Larva feeds on the date and cocoa-nut palms" (*Atkinson*, MS. note).

PAMPHILA BAMBUSÆ, n. sp. (Plate XLV. figs. 11 & 12, ♂ ♀).

Allied to *P. augias*, Linn., from typical Java specimens of which it differs in its somewhat broader and less pointed wings. Markings above similar, but more defined, the borders of the wings blacker, the basal yellow streak on hind wing confined to a terminal spot at the end of the cell, and the abdominal border black. On the underside the markings are also more clearly defined and the interspaces blacker.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{4}{8}$ inch.

Hab. Calcutta (*Frith and Atkinson*). In coll. F. Moore and Dr. Staudinger.

"Larva feeds on the bamboo" (*Atkinson*, MS. note).

PAMPHILA SUBOCHRACEA, n. sp.

Upperside glossy luteous olive-brown; cilia yellowish-cinereous. *Male.* Fore wing with two pale semidiaphanous spots at end of the cell, three contiguous spots obliquely before the apex, three upper discal spots, below which is a narrow white oblique streak or brand: hind wing with three small yellow upper discal spots, the two lowest small. *Female.* Fore wing with a lower or fourth discal spot, and a small dot below the third spot; the spots angled outward: hind wing as in male. Underside greenish-ochreous, brown on hind border of fore wing and anal lobe; marginal line brown and prominent: fore wing with the lower spot diffused and white: hind wing with the upper discal white spot large and quadrate; four spots below in a slightly linear position, the upper spot indistinct; a white spot also at upper end of cell, and a smaller indistinct spot above it.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Atkinson*). In coll. Dr. Staudinger.

Allied to *P. mathias*, Fabr., but of larger size and more prominently marked.

PAMPHILA BRAHMA, n. sp. (Plate XLV. fig. 8.)

Male. Upperside deep ochreous-brown, basal area ochreous. Cilia cinereous-yellow: fore wing with a black-bordered white streak obliquely below the cell, a semidiaphanous yellowish-white constricted spot at end of cell, a small subapical streak of three spots, and two large discal spots, the one above hind margin being ochreous: hind

wing with an indistinct cell-spot and a discal series of three pale yellowish, semidiaphanous spots. Underside greenish-ochreous; costal base of fore wing ochreous-red, hind margin broadly dusky black and centred by a white streak; markings as above, but less distinct.

Female brown above, with less ochreous at base, the spots more prominent. Underside as in male.

Expanse $1\frac{3}{8}$ inch.

Hab. Masuri, 7000 feet, N.W. Himalaya. In coll. Major Lang and F. Moore.

Nearest allied to *P. subhyalina*, Ménétr., from China.

PAMPHILA SIVA, n. sp.

Male. Allied to preceding (*P. brahma*). Darker brown above, the base of fore wing and large lower discal spot only being ochreous, upper semidiaphanous spots brighter yellow, the one between the lower median branches broader; spots on hind wing prominent. Underside brighter greenish-ochreous, base of costa not ochreous red: spots on hind wing clear white, very prominent and with dark border.

Expanse $1\frac{3}{8}$ inch.

Hab. Khasia hills (*G. Austen*). In coll. F. Moore.

ASTICTOPTERUS OLIVASCENS, n. sp.

Allied to *A. unicolor*, Brem. (Ménétr. Catal. Mus. Pet. Lep. i. t. 5. f. 6), from Pekin and Hong Kong, but of larger size. Upperside uniform glossy olive-brown. *Female* with a white, semidiaphanous, narrow subapical spot crossed by the fourth and fifth subcostal branches. Underside: *male* uniformly brown; hind wing sparsely grey-speckled: *female* with subapical spot on fore wing as above, the exterior margin grey-speckled; hind wing with three ill-defined, sparsely grey-speckled, transverse bands. Palpi, body, and legs beneath grey.

Expanse $1\frac{6}{10}$ inch.

Hab. Salween, Moulmain (*Lieut. R. C. Bevan*); Darjeeling (*Atkinson and Dr. Staudinger*). In coll. F. Moore.

CYCLOPIDES SUBVITTATUS, n. sp.

Male and Female. Upperside dark vinous-brown; extreme edge of both the costa and cilia chrome-yellow. Female with an oblique subapical small chrome-yellow streak, composed of three connected spots crossed by two branches of subcostal vein. Underside: fore wing vinous-brown, with the costal vein, subcostal veins along their marginal end, and a narrow outer marginal band chrome-yellow: hind wing chrome-yellow, with partly interrupted black streaks between the veins.

Expanse $1\frac{1}{2}$ inch.

Hab. Salween district, Moulmain (*Lieut. R. C. Bevan*). In coll. F. Moore.

Note. Also in Mr. Atkinson's collection, labelled Darjiling.

CYCLOPIDES SUBRADIATUS, n. sp.

Male and Female. Allied to *C. subvittatus*. Differs in being larger, the fore wing above having a very indistinct yellow streak, which is composed of two well-separated spots only. Underside brighter-coloured, and the streak between the veins more clearly defined.

Expanse 1 to $1\frac{1}{8}$ inch.

Hab. Khasia hills (*Godwin-Austen*). In coll. F. Moore.

ISOTEINON ATKINSONI, n. sp. (Plate XLV. fig. 10.)

Male. Upperside dark glossy olive-brown; cilia brownish cinereous, with a brown inner line and indistinct bars: fore wing with a small yellow semidiaphanous spot at end of the cell, three smaller contiguous spots obliquely before the apex, and two contiguous spots obliquely on the disk. Underside speckled with ochreous-green: fore wing marked as above: hind wing with a median discal curved series of eight small prominent white spots, and a spot at end of the cell.

Expanse $1\frac{1}{10}$ inch.

Hab. Darjiling (*Atkinson*). In coll. Dr. Staudinger.

ISOTEINON KHASIANUS, n. sp.

Male. Upperside glossy ochreous-brown; cilia brownish-cinereous, with a brown inner line and indistinct bars: fore wing with a small silky-white semidiaphanous spot at end of the cell, three contiguous spots before the apex and two on the disk. Underside rufous-brown: fore wing marked as above; a small tuft of black hairs on middle of hind margin: hind wing grey-speckled, a small white spot at end of the cell, and a median discal curved series of white dots, each surrounded by dark brown.

Expanse $1\frac{1}{10}$ inch.

Hab. Khasia hills (*Godwin-Austen*). In coll. F. Moore.

A specimen of what I believe to be the female of this species is in the collection of Dr. Staudinger, but without a locality (though probably Indian). It differs from the male above described in having the spots on the fore wing slightly larger, the cell-spot transversely elongated, and in there being an additional spot below the two on the disk. It is also greyer on the underside; the hind margin on the fore wing has a very pale border; and the hind wing has no perceptible white dots.

ISOTEINON MASURIENSIS, n. sp. (Plate XLV. fig. 3.)

Male and Female. Upperside bluish purple-brown. Cilia white, alternated with brown: fore wing with a large semidiaphanous white quadrate spot at end of the cell, two contiguous elongated spots below it (and in the male a smaller spot below these), three very small spots before the apex. Underside dark brown, numerously speckled with ochrey-brown scales: fore wing marked as above: hind wing with a discal series of three small indistinct white spots, one being

between the subcostal branches, the others between the upper median branches. Body and legs beneath speckled with ochreous-green.

Expanse $1\frac{1}{8}$ inch.

Hab. Masuri, N.W. Himalaya. In coll. Major Lang and F. Moore.

"On clover, June, 7000 feet" (MS. note).

THANAOS STIGMATA, n. sp.

Male and Female. Upperside glossy olive-brown: fore wing with a short black bar or brand of raised scales obliquely above middle of hind margin, and a very indistinct upper discal slightly curved row of six small pale spots; cilia whitish-cinereous, with slight brown bars. Underside paler; costal border of fore wing, veins, and basal interspaces of hind wing speckled with greenish-grey; fore wing with whitish discal maculated band as above, but more distinct, a spot at end of the cell, and a marginal row of lunules less distinct; hind wing with a distinct whitish cell-spot and a submarginal and marginal lunular band. Female without the raised bar, and the discal band above less distinct.

Expanse, ♂ 1 inch, ♀ $\frac{9}{10}$ inch.

Hab. Masuri (7000 feet), N.W. Himalaya. In coll. Major Lang and F. Moore.

"Common in clover-fields" (*Lang*).

THANAOS INDISTINCTA, n. sp.

Upperside uniform olive-brown; cilia edged with cinereous: fore wing with a very indistinct grey-speckled submarginal and marginal line: hind wing with indistinct grey-speckled veins, basal interspaces, and two outer indistinct lunular bands. Palpi and body greyish-white beneath.

Expanse $\frac{8}{10}$ inch.

Hab. Salween, Moulmain (*Lieut. R. C. Bevan*). In coll. F. Moore.

THANAOS OBSOLETA, n. sp.

Allied to *T. stigmata*. Differs above in the absence of the short black oblique bar or brand on the fore wing; the maculated band being slightly more prominent. Underside similarly speckled, the bands on hind wing not lunular, but composed of a slightly broader series of spots; some spots also present around the cell-spot.

Expanse $1\frac{1}{2}$ inch.

Hab. Cherra Punji, Assam (*Atkinson*). In coll. Dr. Staudinger.

EXPLANATION OF PLATE XLV.

Fig. 1. *Halpe radians*, n. sp., p. 690.
2. *Calliana pieridoides*, n. sp., p. 687.
3. *Isoteinon masuriensis* ♂, n. sp., p. 693.
4. *Hesperia narooa* ♂, n. sp., p. 687.
5. —— *subgrisea* ♂, n. sp., p. 689.

Fig. 6. *Pamphila palmarum* ♂, n. sp., p. 690.
7. —— *palmarum* ♀, n. sp., p. 690.
8. —— *brahma*, n. sp., p. 691.
9. *Halpe ceylonica*, n. sp., p. 690.
10. *Isoteinon atkinsoni*, n. sp., p. 693.
11. *Pamphila bambusæ* ♂, n. sp., p. 691.
12. —— *bambusæ* ♀, n. sp., p. 691.
13. *Pithauria murdava*, p. 689.

7. List of Lepidopterous Insects collected by the late R. Swinhoe in the Island of Hainan. By F. Moore, Assistant Curator, India Museum, London.

[Received June 11, 1878.]

RHOPALOCERA.

Danaidæ.

Danais limniace.

Papilio limniace, Cram. Pap. Exot. i. pl. 59. f. D, E.

Danais aglea.

Papilio aglea, Cram. Pap. Exot. iv. pl. 377. f. E.

Danais plexippus.

Papilio plexippus, Linn. S. N. i. 2, p. 767.

Danais chrysippus.

Papilio chrysippus, Linn. S. N. i. 2, p. 767.

Euploea felderi.

Euploea felderi, Butler, P. Z. S. 1866, p. 275.

Allied to *E. layardi*, Druce, P. Z. S. 1874, pl. xvi. f. 1, from Siam; differing above in having all the spots on the fore wing larger, those on the hind wing being smaller, and the inner row nearly obsolete towards the anal angle.

Salpinx minorata, n. sp.

Male. Upperside dark brown: fore wing glossed with blue; two small narrow bluish-white streaks beyond the cell, a less distinct streak above the submedian vein, a submarginal series, and a marginal row of indistinct speckled spots: hind wing with pale canescent subbasal patch and two marginal rows of small indistinct white spots. Underside paler brown: fore wing with three purplish-white discal spots, a smaller costal spot, and two marginal series of white dots: hind wing with two marginal series of white dots.

Expanse $2\frac{5}{8}$ inches.

Hab. Hainan. In coll. H. Druce.

Allied to *S. kluyi*, Moore, but of much smaller size; it is also distinct from *S. hobsoni*, Butler, P. Z. S. 1877, p. 811, from Formosa.

SATYRIDÆ.

LETHE EUROPA.

Papilio europa, Fabr. Syst. Nat. p. 500.

ZOPHOESSA MUIRHEADI.

Lasiommata muirheadi, Felder, Wien. ent. Monats. vi. p. 28.

MELANITIS ISMENE.

Papilio ismene, Cram. Pap. Exot. i. pl. 26. f. A, B.

MYCALESIS PERSEUS.

Papilio perseus, Fabr. Syst. Ent. p. 488.

MYCALESIS RUNEKA.

Mycalesis runeka, Moore, Cat. Lep. E.I. C. i. p. 234.

MYCALESIS CHARAKA.

Mycalesis charaka, Moore, P. Z. S. 1874, p. 566.

YPHTHIMA PANDOCUS.

Yphthima pandocus, Moore, Cat. Lep. E.I. C. i. p. 235; Hewits. Trans. Ent. Soc. 1865, p. 290, pl. 18. f. 12.

YPHTHIMA ZODIACA.

Yphthima zodiaca, Butler.

ELYMNIAS HAINANA, n. sp.

Male. Upperside brownish purple-black: fore wing with narrow bright blue marginal spots: hind wing with outer border broadly ferruginous.

Female. Dark ferruginous-brown; disk of both wings indistinctly brighter ferruginous; narrow marginal spots on fore wing pale purple; small whitish submarginal spots on hind wing. Underside with the basal portion numerously covered with dark brown strigæ, the outer borders paler and with less and narrower strigæ; the apical grey patch on fore wing prominent; and costal spot on hind wing small but distinct.

Expanse $2\frac{6}{8}$ inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

Allied to the Bornean species *E. nigrescens*, Butler, P. Z. S. 1871, p. 520.

PAPILIONIDÆ.

PAPILIO PAMMON.

Papilio pammon, Linn. S. N. i. 2, p. 746, ♂.
P. polytes, Linn. ib. p. 746, ♀.

PAPILIO HELENUS.

Papilio helenus, Linn. S. N. i. 2, p. 745.

PAPILIO ACHATES.

Papilio achates, Cram. Pap. Exot. pl. 182. f. A, B.

PAPILIO MALAYANUS.

Papilio malayanus, Wallace, Trans. Linn. Soc. 1865, p. 59.

PAPILIO SWINHOEI, n. sp.

Allied to *P. nomius*, Esper, from S. India. Differs on the upperside in the fore wing having the costal bands broader, the submarginal row of spots smaller and narrower; the hind wing is also shorter, the upright black bands broader, the two pale spots beneath them widely separated, and the marginal lunules much narrower. On the underside the hind wing has the discal red maculated band more heavily margined with black.

Expanse, ♂ 2⅝, ♀ 3 inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

PAPILIO AXION.

Papilio axion, Felder, Verh. zool.-bot. Ges. xiv. p. 305 (1864).
P. euryphilus, Hübner, Samml. exot. Schm.

PAPILIO MEGARUS.

Papilio megarus, Westw. Arc. Ent. ii. pl. 79. f. 2.

PAPILIO SATURATA, n. sp.

Distinguished from Indian specimens of *P. panope* by its intense and uniform dark colour throughout the upperside, being of a much darker tint than any specimens from India; the marginal spots on the fore wing small but very prominent. In the hind wing there is an outer marginal series of broad quadrate ochreous spaces, a submarginal row of very narrow brown-speckled ochreous angular lunules, and an inner row of acutely angular, scarcely perceptible ochreous marks. Underside also very dark-coloured; the base of fore wing black-tinted; quadrate ochreous spots on outer margin of hind wing very broad; submarginal lunules white.

Expanse 4 inches.

Hab. Hainan. In coll. H. Druce.

MORPHIDÆ.

CLEROME EUMEUS.

Papilio eumeus, Drury, Ill. Exot. Ent. i. pl. 2. f. 3.

NYMPHALIDÆ.

ATHYMA LEUCOTHOË.

Papilio leucothoë, Linn. S. N. i. 2, p. 780.

NEPTIS HAINANA, n. sp.

Near to *N. eurynome*, Westw. (Donov. Ins. of China, 2nd edit. p. 66, pl. 35. f. 4), from China. Differs above in its more compactly

disposed maculated bands, the fore wing having the discoidal streak comparatively broader and its terminal portion more elongated at the point; in the hind wing the subbasal band is straighter and of equal width throughout, the submarginal band being narrower. The underside is of a much paler orange-yellow colour, and the bands less black-bordered, being similar in both these respects to the Assam species *N. kamrupa*, Moore.

Expanse, ♂ $2\frac{1}{4}$ inches.

Hab. Hainan. In coll. H. Druce.

NEPTIS RIHODONA, n. sp.

Allied to *N. hordonia*, Stoll; differs above in the bands being broader, those on the hind wing considerably so, in the male these latter also having a prominently waved outer border. Both wings in the male have a well-marked outer marginal band.

Expanse, ♂ $1\frac{6}{8}$, ♀ 2 inches.

Hab. Hainan. In coll. H. Druce.

ERGOLIS ALTERNUS, n. sp.

Nearest allied to the typical *E. ariadne* from Java. Differs in its more deeply excavated margins, the upperside being of a more yellowish-ferruginous colour between the discal and marginal bands; the broad basal portion, the median discal band, and marginal band of a deeper dusky ferruginous, the discal band also being distinctly and darker maculated. Underside with broad dark dusky chestnut-brown suffused bands.

Expanse 2 inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

CYRESTIS THYODAMAS.

Cyrestis thyodamas, Boisd., Cuv. Règ. An., Ins. ii. pl. 138. f. 4.

Identical with Indian specimens.

CYRESTIS COCLES.

Papilio cocles, Fabr. Mant. Ins. ii. p. 7; Donov. Ins. Ind. pl. 23. f. 2.

JUNONIA LEMONIAS.

Papilio lemonias, Linn. S. N. i. 2, p. 770.

JUNONIA LAOMEDIA.

Papilio laomedia, Linn. S. N. i. 2, p. 772; Drury, Ill. Exot. Ent. pl. 5. f. 3.

JUNONIA ŒNONE.

Papilio œnone, Linn. S. N. i. 2, p. 770; Cramer, Pap. Exot. i. pl. 35. f. A–C.

One specimen from Ho Ching Shang, agreeing in size with those from India, but smaller than the Chinese.

JUNONIA ALMANA.

Papilio almana, Linn. S. N. i. 2, p. 769; Cramer, Pap. Exot. i. pl. 58. f. F, G.

SYMPHÆDRA PARDALIS, n. sp.

Allied to *S. dirtea*, Fabr. Differs in the male having somewhat shorter wings, the fore wing more convex on the costa, the outer margin being slightly concave, and the antennæ are shorter and less robust. Distinguished on the fore wing above by the broad greenish grey marginal band, which is uniformly coloured and extends to the apex; the band on the hind wing is also comparatively broader, the submarginal spots larger, and irrorated with greenish-grey anally. The underside is more uniformly ferruginous, but with the spots paler.

Female with the spots above of a greenish-yellow tint.

Expanse, ♂ $3\frac{1}{8}$, ♀ $3\frac{5}{8}$ inches.

Hab. Hainan. In coll. H. Druce.

DIADEMA AVIA.

Papilio avia, Fabr. Ent. Syst. iii. 1, p. 111.
Papilio iacintha, Drury, Ill. Exot. Ent. ii. pl. 21. f. 1, 2.

ATELLA PHALANTA.

Papilio phalanta, Drury, Ill. Exot. Ent. i. pl. 21. f. 1, 2.
P. columbina, Cram. Pap. Exot. iii. pl. 238. f. A, B.

MESSARAS ERYMANTHIS.

Papilio erymanthis, Drury, Ill. Exot. Ent. i. pl. 15. f. 3, 4.

CETHOSIA BIBLIS.

Papilio biblis, Drury, Ill. Exot. Ent. i. pl. 4. f. 2.

PIERIDÆ.

NYCHITONA XIPHIA.

Papilio xiphia, Fabr. Spec. Ins. ii. p. 43.
P. nina, Fabr. Ent. Syst. iii. 1, p. 194.

CATOPSILIA GNOMA.

Papilio gnoma, Fabr. Syst. Ent. App. p. 808.

TERIAS ÆSIOPE.

Terias æsiope, Ménétr. Cat. Lep. Mus. Petr. p. 85, pl. 2. f. 3.

TERIAS SUBDECORATA, n. sp.

Upperside deep yellow: fore wing with a moderately broad blackish border, the inner margin of which forms a slightly sinuous curve in the male, but a more angled curve in the female: hind wing with a slight speckled spot at end of the veins. Underside similarly but more prominently marked, as in *T. æsiope*, Ménétr.

Expanse, ♂ $1\frac{6}{8}$, ♀ $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. H. Druce.

TERIAS ATTENUATA, n. sp.

Male. Upperside with a very narrow black border, its inner margin but very slightly sinuous; costal margin blacker than in the other species: hind wing with a very narrow indistinct speckled border. Underside with markings similar to *T. æsiope*, but smaller and narrower.

Expanse $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. F. Moore.

TERIAS ARCUATA, n. sp.

Male. Allied to *T. subdecorata*. Differs above in having a more regularly curved inner margin to the black border of the fore wing, a nearly continuous speckled border on hind wing, and in the markings beneath being nearly obsolete.

Expanse $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. F. Moore.

TERIAS HAINANA, n. sp.

Male and Female. Allied to *T. drona*, Horsf., from Java. Differs on the fore wing in the marginal band being narrower and slightly broken at its termination on posterior angle; the hind wing has the band very narrow and sinuous, being nearly obsolete at the anal end in the female; cilia pinkish. Underside paler yellow; two prominent small black spots at end of the cell on fore wing and dusky speckled markings on hind wing.

Expanse $1\frac{4}{10}$ inch.

Hab. Hainan. In coll. H. Druce.

A distinct species from *T. vagans*, Wallace, P. Z. S. 1866, p. 357.

THESTIAS SESIA.

Papilio sesia, Fabr. (Donov. Ins. China, pl. 31. f. 2).
Papilio evippe, Drury, Ill. Ins. pl. 5. f. 2, ♂.
Papilio pyrene, Cram. ii. pl. 125. f. C, ♂.

APPIAS ZELMIRA.

Papilio zelmira, Cram. iv. pl. 320. f. C, D, ♀.

APPIAS AMASENE.

Papilio amasene, Cram. Pap. Exot. i. pl. 44. f. A.

APPIAS COPIA.

Pieris copia, Wallace, Trans. Ent. Soc. 1867, p. 340.

One specimen (male) from Ho Ching Shang.

APPIAS INORNATA, n. sp.

Allied to *A. vacans*, Butler, from Sikkim.

Male. Upperside with the markings similar to *A. hippo* (Cramer, pl. 195. f. B, C). *Female* as in *A. vacans*, having the costal border of fore wing, and outer borders of both wings only, black. Underside of male with the apical spot on fore wing and the hind wing deep

yellow, the former absent and the latter paler in the female; outer border of hind wing narrow, and of a golden-brown colour.

Expanse $2\frac{1}{4}$ inches.

Hab. Hainan. In coll. H. Druce.

This is quite a distinct species from the Formosan (*A. formosana*), described by Mr. Wallace in P. Z. S. 1866, p. 356.

SYNCHLOË CANIDIA.

Papilio canidia, Sparrm. Amœn. Acad. vii. p. 504 (1768).
P. gliciria, Cramer, pl. 171. f. E, F.

THYCA PASITHOË.

Papilio pasithoë, Linn. S. N. i. 2, p. 755.
P. dione, Drury, Ill. Exot. Ent. ii. pl. 8. f. 3, 4.

ERYCINIDÆ.

SOSPITA SATURATA, n. sp.

Form of outline as in *S. lydda*, Hewits. Exot. Butt. iii. *Sosp.* pl. fig. 13, from Hong Kong. Upperside dark purple-brown, basal half darkest: hind wing with very indistinct small black white-bordered apical and anal spots. Underside brighter; pale bands distinct, the discal band broad, nearly straight on fore wing, and its inner border darker-coloured; three small white-bordered black apical and two anal spots on hind wing.

Female brighter-coloured.

Expanse $1\frac{6}{8}$ inch.

Hab. Hainan. In coll. H. Druce and F. Moore.

ZEMEROS CONFUCIUS, n. sp.

Z. confucius, Wallace, MS.

Male. Smaller than Javan or Indian specimens of *Z. flegyas*. Markings above similar; the subapical spots larger and indistinct, two only being visible above, these being white and prominent beneath.

From *Z. albipunctata*, Butler, from Malacca, it may be distinguished by the much less prominent and smaller number of subapical spots both above and beneath, and in the inner series of spots on both wings being white-bordered as in *Z. flegyas*.

Expanse $1\frac{4}{10}$ inch.

Hab. Hainan. In coll. H. Druce.

LYCÆNIDÆ.

MILETUS CHINENSIS.

Miletus chinensis, Felder, Verh. zool.-bot. Ges. xii. p. 488 (1862).

LUCIA DILAMA, n. sp.

Male. Similar to *L. epius* (Westw. Gen. D. L. p. 502, pl. 76. f. 5) from India. Underside of a browner grey, the transverse zig-

zag markings less defined, and the white interspace beyond the end of the cell much wider.

Expanse 1 inch.

Hab. Hainan. In coll. H. Druce.

PITHECOPS NIHANA, n. sp.

Upperside dusky brown; cilia white: fore wing with a slight white brown-speckled longitudinal central patch, and hind wing with a similar streaky subapical patch. Underside white: fore wing with a submarginal series of six very narrow, dusky, short, recurved marks, and a marginal series of narrow dusky lunules bordered within by an indistinct lunular line: hind wing with a moderately large black costal spot before the apex, and a smaller spot on abdominal margin; a series of very indistinct dusky submarginal and marginal streaks.

Expanse $1\frac{1}{12}$ inch.

Hab. Hainan. In coll. H. Druce and F. Moore.

POLYOMMATUS LAIUS.

Papilio laius, Cramer, Pap. Exot. iv. pl. 319. f. D, E.

POLYOMMATUS VARUNANA.

Polyommatus varunana, Moore, P. Z. S. 1865, p. 772, pl. 41. f. 6.

POLYOMMATUS SIMILIS, n. sp.

Allied to *P. argia*, Ménétr. Cat. Lep. Mus. Petr. p. 125. pl. x. f. 7. from Japan. Differs above in being of a pale lilac-blue, the margin of the fore wing less dusky, and the hind wing with the marginal spots scarcely perceptible (both these characters in *P. argia* are very prominent). On the underside the colour is of a brownish-grey; markings similar, but those of fore wing less prominent, the spots on the hind wing having the centre of the same tint as the ground-colour of the wing.

Expanse $1\frac{1}{12}$ inch.

Hab. Hainan. In coll. H. Druce and F. Moore.

LAMPIDES BÆTICUS.

Papilio bæticus, Linn. S. N. i. 2, p. 789.

LAMPIDES KANDARPA.

Lycæna kandarpa, Horsf. Cat. Lep. E.I. C. 1829, p. 82.

APHNÆUS LOHITA.

Amblypodia lohita, Horsf. Cat. Lep. E.I. C. 1829, p. 106.

ILERDA BELENA.

Heliophorus belenus, Hübner, Zutrage, f. 785 (1832).

MAHATHALA, n. g.

Wings broad: fore wing somewhat short, exterior margin nearly erect and slightly scalloped; third subcostal branch bifurcate: hind

wing short; costa abbreviated, lobed at the base, concave towards the end, the apex produced and pointed upward; exterior margin slightly concave below the apex, and very convex in the middle; anal angle lobed; a spatulate tail extending from end of lower median vein; palpi long, stout, apical joint broad laterally; antennæ thickened to apex.

Differs from typical *Amblypodia* (*A. narada*, Horsf.) in the entirely different form of wings; the fore wing having the third branch of the subcostal vein bifurcate instead of trifurcate, as in male of *A. narada*.

MAHATHALA AMERIA.

Amblypodia ameria, Hewits. Cat. Lyc. B. M. p. 14, pl. 8. f. 85.

HALPE BETURIA.

Hesperia beturia, Hewits. Desc. *Hesp.* p. 36 (1868).

HESPERIDÆ.

HESPERIA GREMIUS.

Hesperia gremius, Fabr. Ent. Syst. Suppl. p. 433; Butler, Cat. Fabr. Lep. B. M. p. 271, pl. 3. f. 7.
H. divodasa, Moore, P. Z. S. 1865, p. 791.

HESPERIA MATHIAS, Fabr. Ent. Syst. Suppl. p. 433; Butler, Cat. Fabr. Lep. B. M. p. 275, pl. 3. f. 8.

The specimens from Island of Ho Ching Shan.

HESPERIA MANGALA, Moore, P. Z. S. 1865, p. 792.

HESPERIA QUINIGERA, n. sp.

Male and Female. Upperside olive-brown; cilia pale cinereous-brown: fore wing with five small pale semidiaphanous spots, two only being subapical, and three obliquely discal: hind wing with a single indistinct pale semidiaphanous spot. Underside pale ochreous-brown; fore wings marked as above.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{4}{10}$ inch.
Hab. Hainan. In coll. H. Druce and F. Moore.

GEGENES HAINANUS, n. sp.

Male. Allied to the European species *G. nostrodamus*, but smaller in size, also much paler above and less grey beneath.

Expanse $1\frac{1}{8}$ inch.
Hab. Hainan. In coll. H. Druce.

PAMPHILA CONFUCIUS.

Pamphila confucius, Felder, Wien. ent. Monat. 1862, p. 29.

ISMENE ARIA.

Ismene aria, Moore, P. Z. S. 1865, p. 784; Hewits. Exot. Butt. iv. *Hesp.* pl. 2. f. 24.

CYCLOPIDES CAMERTES.

Cyclopides camertes, Hewits. Desc. *Hesp.* p. 43 (1868).

HETEROCERA.

BOMBYCES.

SYNTOMIDÆ.

RHAPHIDOGNATHA HAINANA.

Artona hainana, Butler, Journ. Linn. Soc. xii. p. 357.

CHALCOSIIDÆ.

PIDORUS GLAUCOPIS.

Phalæna glaucopis, Drury, Exot. Ins. ii. p. 11, pl. 6. f. 4.

CHALCOSIA NYMPHA, n. sp.

Male. Fore wing silvery-white; a circular purple-black spot in middle of the cell, and a speckled spot obliquely below it; apical band purple-black, traversed with white spots: hind wing with a black-streaked pale blue apical band, the extreme margin and cilia being white. Head and collar crimson; body metallic green; antennæ black; legs grey.

Expanse $1\frac{11}{12}$ inch.

Hab. Hainan. In coll. F. Moore.

Allied to *C. diana*, Butler, P. Z. S. 1877, p. 815, from Formosa.

EUSCHEMA MILITARIS.

Phalæna militaris, Linn. S. N. i. 2, p. 811.

LITHOSIIDÆ.

UTETHESIA PULCHELLA.

Phalæna pulchella, Linn. S. N. i. 2, p. 884; Guér.-Mén. Icon. Règ. An. pl. 88. f. 8.

BOMBYCIDÆ.

ARISTHALA, nov. gen.

Fore wing elongate, trigonate, falcate; costa moderately arched at the end; apex convex; exterior margin oblique, concave below the apex, slightly produced and angled in middle; posterior margin nearly straight, angle acute; costal and subcostal with its first and second branches running close together along the extreme margin, third branch trifurcate at nearly equal distances, the two upper ascending to the costa, the first before the second to the apex, the third to below the apex; discocellulars bent inward at the middle, upper shortest; upper radial as a subcostal branch beyond the cell, lower radial from angle of discocellulars; a discoidal veinlet emitted within the cell parallel to lower radial; median vein three-branched at equal distances, upper from end of the cell; a submedian and internal vein close to the margin. Hind wing elongated, narrow, apex

and exterior margin very convex; anal angle concave in male, angled in female; abdominal marginal long, nearly straight, fringed; two subcostal branches emitted beyond the cell; discocellulars very oblique, bent outward; one radial from their angle; median three-branched, two upper from end of cell; a submedian and internal vein. Body stout, with a dorsal crest and anal lateral tuft; antennæ short, bipectinate to near end; palpi very small; legs very hairy and tufted to end of tarsi.

This genus is allied to *Ocinara* and *Ernolatia*, Walker, to *Trilocha*, Moore, and to *Bombyx* (*B. mori*, Linn.).

ARISTHALA HAINANA, n. sp.

Female. Fore wing dark ferruginous; posterior border brighter ferruginous; discal area speckled with buff and purple-brown scales; an oblique curved subbasal and two discal sinuous darker lines; a small bright-coloured ferruginous spot at end of the cell; exterior border speckled with chalybeous-white: hind wing yellowish-ferruginous, with short basal, median, and narrower discal purple-brown bands; a subanal lunular white streak bordered above with purple-brown. Thorax dark ferruginous; abdomen greyish-ferruginous; head, legs, and body beneath brighter ferruginous. Underside bright ferruginous: fore wing palest at base: exterior border dusky and white-speckled; one blackish transverse discal line: hind wing with outer curved discal line, two discocellular spots, and indistinct median fascia; anal angle speckled with dusky-brown and white.

Expanse 2 inches.

Hab. Hainan. In coll. F. Moore.

A closely allied species of this genus, from which the generic characters of the male have been taken, is found in the Sikkim Himalayas.

LIPARIDÆ.

PANTANA AMPLA.

Pantana ampla, Walker, Cat. Lep. Het. B. M. iv. p. 820.

PYRALES.

LEPYRODES GEOMETRALIS.

Lepyrodes geometralis, Guén. Spec. Gén. Lép. Delt. et Pyr. p. 278.

Tabular List showing Geographical Distribution.

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
Danaidæ.						
Danais limniace	*	...	*	*		
—— aglea	*					
—— plexippus	*	*	*	*		
—— chrysippus	*	*	*	*		
Euplœa Felderi	*	...	...	...	*	
Salpinx minorata	*					
Satyridæ.						
Debis europa	*	*	*	...	*	*
Zophoessa muirheadi	*	...	*			
Melanitis ismene	*	*	*	*	*	*
Mycalesis perseus	*	...	...	...	*	*
—— runeka	*	...	...	...	*	*
—— charaka	*	...	...	...	...	*
Yphthima pandocus	*	...	...	...	*	
—— zodiaca	*	...	...	...	*	
Elymnias hainana	*					
Papilionidæ.						
Papilio pammon	*	*	*			
—— helenus	*	...	*			
—— achates	*	...	...	*	*	
—— malayanus	*	*	...	...	*	
—— swinhoei	*					
—— axion	*	...	...	...	...	*
—— megarus	*	...	...	...	...	*
—— saturata	*					
Morphidæ.						
Clerome eumeus	*	...	*			
Nymphalidæ.						
Athyma leucothoë	*	*	*	*	*	*
Neptis hainana	*					
—— rihodona	*					
Ergolis alternus	*					
Cyrestis thyodamas	*	*	...	...	...	*
—— cocles	*	...	*	*		
Junonia lemonias	*	*	*	*	*	*
—— laomedia	*	...	*	*	*	*
—— œnone	*	...	*	...	*	*
—— almana	*	*	*	...	*	*
Symphædra pardalis	*					
Diadema avia	*	...	*	...	*	
Atella phalanta	*	...	*	*	*	*

Tabular List (continued.)

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
NYMPHALIDÆ (*continued*).						
Messaras erymanthis	*	*	*	*		
Cethosia biblis	*	...	*	...	*	*
PIERIDÆ.						
Nychitona xiphia	*	...	*	*	*	*
Catopsilia gnoma	*	*	*			
Terias æsiope	*	*	*			
—— subdecorata	*					
—— attenuata	*					
—— arcuata	*					
—— hainana	*					
Thestias sesia	*	...	*			
Appias zelmira	*	...	*	...	*	*
—— amasene	*	...	*			
—— copia	*	...	...	...	...	*
—— inornata	*					
Synchloë canidia	*	...	*	...	*	*
Thyca pasithoë	*	...	*			
ERYCINIDÆ.						
Sospita saturata	*					
Zemeros confucius	*					
LYCÆNIDÆ.						
Miletus chinensis	*	...	*			
Lucia dilama	*					
Pithecops nihana	*					
Polyommatus laius	*	...	*	...	*	*
—— varunana	*	*	*	...	*	*
—— similis	*					
Lampides bæticus	*	...	*	...	*	*
—— kandarpa	*	*	...	...	*	*
Aphnæus lohita	*	...	...	*	*	
Ilerda belena	*	...	...	...	*	
Mahathala ameria	*	...	...	...	...	*
HESPERIDÆ.						
Hesperia gremius	*	...	...	...	*	*
—— beturia	*	...	...	...	...	*
—— mathias	*	*	...	*	*	*
—— mangala	*	...	...	...	...	*
—— quinigera	*					
Gegenes hainanus	*					
Pamphila confucius	*					
Ismene aria	*	...	...	...	*	*
Cyclopides camertes	*	...	...	...	*	*

Tabular List (continued).

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
BOMBYCES.						
Rhaphidognatha hainana	*					
Pidorus glaucopis	*	...	*	...	...	*
Chalcosia nympha	*					
Euschema militaris	*	...	*	...	*	*
Utethesia pulchella	*	*	*	...	*	*
Aristhala hainana	*					
Pantana ampla	*	...	*			
PYRALES.						
Lepyrodes geometralis	*	*	*	...	*	*

8. Contributions to the Ornithology of the Philippines.—No. X. On the Collection made by Mr. A. H. Everett in the Island of Bohol. By ARTHUR, Marquis of TWEEDDALE, F.R.S., President of the Society.

[Received June 14, 1878.]

The island of Bohol lies between Leyte and Zebu, and is situated about seventy miles N.W. of Mindanao. It has a length of about forty miles and a breadth of thirty miles. After leaving Leyte, Mr. Everett stopped for a week at Talibon, on the north coast of the island, and then left for Palawan, while his brother proceeded to the interior of the island to collect. There he found a country covered with grass 12 feet high, and with no forest except on the tops of a few hills. Birds were scarce; and he had to return stricken with fever. The collection obtained in North Bohol contains representatives of 47 species; and although all belong to previously known birds, seven of them have not been hitherto recorded as being inhabitants of the Philippines. These are:—

Cisticola cursitans.
Alauda wattersi.
Terekia cinerea.
Limicola platyrhyncha.
Limosa lapponica.
Tringa albescens.
Strepsilas interpres.

The rest of the species are generally distributed throughout the archipelago, with perhaps the exceptions of *Lanius nasutus*, which appears to be a northern form, and *Orthotomus frontalis* and *Loriculus hartlaubi*, which are southern species.

1. Loriculus hartlaubi (7) ?

[Bohol, ♀, October.]

Only one example of a female, and not in full dress. It agrees with individuals of true *L. hartlaubi* in a similar stage of plumage, but has the maxilla shorter by one tenth of an inch.

2. Haliastur intermedius (17).

[N. Bohol, ♂ ♀, October.]

3. Butastur indicus (20).

[N. Bohol, ♀, October: iris golden-yellow; bill black; cere and base of bill bright chrome-yellow; legs and feet dirty chrome-yellow; nails black.]

4. Merops philippinus (35).

[N. Bohol, ♂, October.]

5. Alcedo bengalensis (38).

[N. Bohol, ♀, October.]

6. Sauropatis chloris (47).

[N. Bohol, ♂ ♀, October.]

7. Cacomantis merulinus (57).

[N. Bohol, ♂, October: iris light red; bill black; base of mandible reddish; nails black; feet and legs waxy Naples-yellow.]

The above note pertains to the adult. Two other examples are in rufous and brown-banded plumage.

8. Centrococcyx viridis (64).

[N. Bohol, ♂ ♀, October.]

The male is immature; the female adult.

9. Lanius nasutus (70).

[N. Bohol, ♂ ♀, October and November.]

10. Lanius lucionensis (72).

[N. Bohol, ♂ ♀, October and November.]

11. Artamus leucorhynchus (73).

[N. Bohol, ♂ ♀, October and November.]

12. Lalage dominica (76).

[N. Bohol, ♂, November.]

13. Leucocerca nigritorquis (83).

[N. Bohol, ♂ ♀, October.]

14. Hirundo javanica.

Hirundo javanica, Sparrm. Mus. Carls. t. 100.

[N. Bohol, ♂ ♀, October.]

15. Broderipus acrorhynchus (90).

[N. Bohol, ♀, October and November.]

16. Ixus goiavier (99).

[N. Bohol, ♀, October.]

17. Pratincola caprata (104).

[N. Bohol, ♂, November. Locust in gizzard.]

18. Cisticola cursitans.

Prinia cursitans, Franklin, P. Z. S. 1831, p. 118; Dresser, B. of Europe, parts lxi., lxii.

[N. Bohol, ♂, October: iris yellow-brown.]

Four examples identical with Indian individuals, but distinct from the Negros example referred to *anteà*, p. 285. no. 31.

19. Orthotomus frontalis.

Orthotomus frontalis, Sharpe, Ibis, 1877, p. 112, t. ii. f. 1; T. L. S. ser. 2, Zool. i. p. 336. no. 85.

[N. Bohol, ♂ ♀, October.]

20. Budytes viridis (114).

[N. Bohol, ♂ ♀, November.]

21. Corydalla lugubris (117).

[N. Bohol, ♂ ♀, October and November.]

22. Cyrtostomus jugularis (123).

[N. Bohol, ♀, October.]

23. Corvus philippinus (125).

[N. Bohol, ♂ ♀, November.]

Female smaller than the male.

24. Calornis panayensis (128).

[N. Bohol, ♂ ♀, October.]

25. Munia jagori (132).

[N. Bohol, ♂, October.]

26. Alauda wattersi.

Alauda wattersi, Swinhoe, P. Z. S. 1871, p. 389.

[N. Bohol, ♂, October.]

A single example of the genus *Alauda*, which most nearly agrees with the South-Formosan race of *A. cœlivox*, separated under the above title by Mr. Swinhoe. The occurrence in the Philippines of any member of the genus has not before been recorded.

27. Osmotrenon vernans (135).

[N. Bohol, ♂ ♀, October.]

28. TURTUR DUSSUMIERI (147).

[N. Bohol, ♂ ♀, October and November.]

29. CHARADRIUS FULVUS (159).

[N. Bohol, ♂ ♀, October.]

30. EUDROMIAS GEOFFROYI (161).

[N. Bohol, ♂ ♀, October and November.]

31. EUDROMIAS MONGOLICUS (163).

[N. Bohol, ♂ ♀, October and November.]

32. ÆGIALITIS DUBIA (162).

[N. Bohol, ♀, October.]

33. ÆGIALITIS CANTIANA.

[N. Bohol, ♀, October.]

34. ÆGIALITIS PERONII.

Charadrius peronii, Temminck, Schlegel, Mus. P.-Bas, Cursores, p. 33.

ÆGIALITIS, sp.?

[N. Bohol, ♂, November.]

35. STREPSILAS INTERPRES.

Tringa interpres, Linn. S. N. i. p. 248.

[N. Bohol, ♂, November. ♀, November: iris chocolate; nails and bill black; legs and feet dirty orange.]

New to the Philippines.

36. LIMOSA LAPPONICA.

[N. Bohol, ♂, November.]

37. RHYACOPHILUS GLAREOLA (182).

[N. Bohol, ♂, November: iris dark brown; bill and nails black; legs and feet yellow-green.]

38. TRINGOIDES HYPOLEUCOS (183).

[N. Bohol, ♂ ♀, October and November.]

39. TOTANUS INCANUS.

Scolopax incanus, Gm. S. N. i. p. 658.

[N. Bohol, ♂ ♀, November: iris chocolate-brown; legs and feet dirty chrome; nails black; bill dark dull grey, base yellow.]

40. TEREKIA CINEREA.

Scolopax cinerea, Guldenstadt, N. Comment. Ac. Sc. Imp. Petropol. xix. p. 473, t. 19 (1775).

[N. Bohol, ♂ ♀, October.]

New to the Philippines.

41. LIMICOLA PLATYRHYNCHA.

Tringa platyrhyncha, Temm. Man. d'Orn. p. 398 (1815).

[N. Bohol, ♀, October.]

The specimens have been submitted to Mr. Dresser, who is of opinion that they belong to this species and not to *L. sibirica*.

42. TRINGA ALBESCENS.

Tringa albescens, Temminck, Pl. Col. 41, f. 2.

[N. Bohol, ♂ ♀, October and November.]

New to the Philippines.

43. GALLINAGO SCOLOPACINA (187).

[N. Bohol, ♂, November.]

44. BUBULCUS COROMANDUS (194).

[N. Bohol, ♀, October.]

45. HERODIAS GARZETTA (195).

[N. Bohol, ♂, October.]

46. DENDROCYGNA VAGANS (203).

[N. Bohol, ♂ ♀, October and November.]

47. STERNA BERGII.

Sterna bergii, Licht. Verz. d. Doubl. Berl. Mus. p. 80.

[N. Bohol, ♂ ♀, November.]

9. On a new Species of Starling. By O. FINSCH, Ph.D., C.M.Z.S.

[Received June 17, 1878.]

This species, which I propose to name after General Poltaratzsky, Governor of Semipalatinsk, is easily distinguishable from our common Starling by having the back green instead of purplish-violet, and the underparts below the neck of a deep purplish-violet instead of green as in the remaining species.

I found this Starling breeding on Lake Marka-Kul, in the Chinese High Altai, about 5000 feet above the sea-level. A careful comparison of it with the rich series of *Sturni* in the British Museum has convinced me that it belongs to a distinct species hitherto confounded with *St. vulgaris* and its allies. The British Museum contains fifteen specimens of the same bird from North-Western India, Persia, and Baluchistan. Specimens from the two last-named localities are marked *St. unicolor* and *St. vulgaris* by Mr. Blanford. The single specimen of a Starling brought home by Mr. Seebohm from the Yenisey belongs also to this species. It is the *St. humei*, Gould (1877), but not of Brooks (1876), and most probably also the *St. vulgaris* of Radde and Schrenck from Eastern Siberia. The

group to which our common Starling belongs contains the following species :—

St. vulgaris, L. ; *St. indicus*, Hodgs. (Nepaul) ; *St. humei*, Brooks (= *nitens*, Hume, = *ambiguus*, Hume) ; *St. purpurascens*, Gould ; and *St. poltaratskyi*, mihi (= *humei*, Gould).

All these species are well marked, and distinguishable even in winter plumage and in the young state, as I intend to show in a more extended description of them.

10. On new Species of Coleopterous Insects (Geodephaga and Longicornia) taken by Dr. Stoliczka during the Forsyth Expedition to Kashgar in 1873–74. By H. W. Bates, F.Z.S.

[Received June 17, 1878.]

The following are preliminary diagnoses of new genera and species of Coleoptera, of the groups above mentioned, taken during the mission of Sir T. Douglas Forsyth to the Amir of Kashgar in 1873–4. Complete descriptions will hereafter appear in the general work on the results of the expedition, now in course of publication at Calcutta.

Geodephaga.

Cicindela stoliczkana.

C. burmeisteri (Fischer) *affinis, sed minor. Nigra ; corpore subtus, pedibus antennarumque basi chalybeo-violaceis ; elytris lunula humerali et apicali fasciaque mediana, lata, abbreviata, recta flavo-albis ; thorace brevi, lateribus fere rectis, supra subtilissime granulatim strigoso ; elytris minute, haud confertim granulatis ; palpis nigris, albo-setosis ; labro albo, convexo, antice medio rotundato producto, unidentato ; corpore subtus pedibusque sparsim albo-pilosis.*

Long 6–7½ lin.

North of the Kuen-lun. Exact locality not given.

Carabus stoliczkanus.

C. caschmirensi (Kollar) *affinis. Maxime elongatus et angustus, niger subnitidus ; thorace late subcordato-quadrato, angulis posticis retrorsum productis, acutis ; elytris angustis, post medium perparum rotundato-dilatatis, dorso tuberculorum triplici serie, inter se carina unica separatis ; menti dente verticaliter exstante, valde compresso.*

Long. 14–15 lin.

Murree.

Dichirotrichus alticola.

Oblongus, supra testaceo-fulvus, capite (maculis rufis exceptis),

thoracis macula discoidali alteraque elytrorum postico-discoidali nigro-æneis; palpis apice acuminatis; capite et thorace grosse subsparsim punctatis, hoc postice angustato, angulis posticis oblique rotundatis, margine postice arcuato; elytris striatis, interstitiis medio leviter culminatis, biseriatim punctatis; corpore subtus nigro; antennis fuscescentibus. ♂. *Tarsi duo antici articulis* 1°–3um *ovatis*, 4° *bilobo.*

Long 2$\frac{1}{8}$ lin.

Pamir, between Sirikol and Panga.

HARPALUS CÆRULEATUS.

Elongato-oblongus, glaber; thorace transversim quadrato, postice distincte angustato, lateribus arcuatis, angulis posticis rotundatis, basi utrinque late subcrebre punctato, margine basali bisinuato; elytris apice fortiter sinuatis, supra striatis, interstitiis planis, impunctatis, tertio unipunctato.

♂ *supra capite thoraceque nigris, politis; elytris cæruleis, subviolaceis, nitidis; antennis nigris, articulo basali rufo; corpore subtus nigro, pectore medio pedibusque rufopiceis; abdomine minus nitido. Immaturus toto corpore castaneo-rufo, elytris violaceis.*

♀ *nigro- vel rufo-castanea, raro obscure nigra; elytris opacis, interdum violaceo tinctis, apice fortius* (*sicut in* H. æneo ♀) *sinuatis.*

Long. 5$\frac{1}{2}$–6 lin.

Yangi Hissar.

HARPALUS MELANEUS.

H. calceato (Dufts.) *forma coloreque similis, at thorace fere impunctato, angulisque posticis obtusis. Oblongus, modice elongatus, niger nitidus, elytris* ♀ *opacis; antennis et palpis nigris, articulis omnibus apice piceo-rufis; thorace transversim quadrato, postice leviter angustato, angulis posticis obtusis, lateribus antice modice arcuatis, basi utrinque vage vix punctato, fovea lineari impresso; elytris apice paullulum sinuatis, supra convexis, simpliciter striatis, interstitiis modice convexis, tertio unipunctato.*

Long. 6 lin.

Sind valley; Murree; near Leh.

HARPALUS TURCULUS.

Oblongus, niger, ♂ *nitidus,* ♀ *sericinitens; antennis articulo primo rufo, palpis apice flavis; capite modice angusto, lævi; thorace quadrato, antice prope angulos rotundato-angustato, postice lateribus exacte parallelis, elytris multo angustiore, angulis posticis rectis, supra impunctato; elytris utroque sexu apice fortiter subrecte sinuatis, supra subtiliter striatis, interstitiis planis, tertio unipunctato; metasterno grosse sparsim punctato.*

Long. 4 lin.

No locality. Probably near Yarkand.

HARPALUS INDICOLA.

Elongato-oblongus, angustior, nigerrimus, ♂ *magis,* ♀ *minus niti-*

da, palpis et antennis fulvis; thorace quadrato, lateribus leniter arcuatis, postice longe angustato, angulis posticis obtusis, basi tota subsparsim punctata et paulo rugosa, fovea utringue obliqua; elytris convexis, apice modice sinuatis, supra striatis (♂ fortius), interstitiis vix convexis, tertio puncto conspicue impresso; sternis et ventre lateribus grosse haud profunde punctatis.

Long. 5 lin.

Murree.

HARPALUS MASOREOIDES.

Parvus, niger subsericeus, lævis, partibus oris antennisque flavo-testaceis, pedibus magis rufescentibus; thorace transverso, elytris vix angustiore, antice gradatim paullulum angustato, angulis posticis rotundatis, lævi, foveola basali utrinque oblonga, marginibus rufescentibus; elytris oblongis, apice late obtusis, leviter sinuatis, supra striatis, striis minutissime punctulatis, interstitiis vix convexis, marginibus reflexis et epipleuris piceo-rufis.

Long. 2½ lin.

Pamir, between Sirikol and Panga.

HARPALUS LIODES.

Ovatus, latus, modice convexus, niger, ♂ sericinitens, ♀ serici-opacus, antennis palpisque piceo-rufis, illis nigro maculatis, tarsis piceo-rufis; capite lato, lævigato, oculis minus prominulis; thorace valde transverso, antice angustato, postice multo latiore, angulis posticis rectis, fere impunctato; elytris ovatis, apice paullulum sinuatis, supra subtiliter striatis, interstitiis planis, tertio minute unipunctato.

Long. 5–5½ lin.

No locality. Probably near Yarkand.

HYPOLITHUS PERLUCENS.

Piceo-niger, læte iridescens, glaber, antennis, palpis et pedibus fulvo-testaceis; capite lævissimo, post oculos angustato, fovea frontali lineari versus oculum curvata; thorace quadrato, lateribus leniter fere æqualiter arcuatis, angulis posticis valde obtusis, margine postico late sinuato, supra limbo toto crebre subtiliter punctulato, polito, marginibus rufescentibus; elytris fortiter striatis, interstitiis paullulum convexis, politissimis, tertio (prope striam secundam) multipunctato.

Long. 4½ lin. ♀.

Jhelam valley.

HYPSINEPHUS, nov. gen.

A genere Selenophoro *differt pedibus elongatis, validis, tarsisque ♂ articulis dilatatis cordatis, primo basi gracili, apice subito dilatato, 4to breviter bilobo. Mentum edentatum; elytra interstitiis alternis pluripunctatis.*

HYPSINEPHUS ELLIPTICUS.

Piceo-niger vel castaneus ; partibus oris, antennis pedibusque fulvo-testaceis ; thorace quadrato, elytris angustiore, lateribus postice explanatis, angulis posticis obtusis, supra impunctato ; elytris elongato-ovatis, striatis, interstitio tertio punctis quinque parvis, quinto versus basin duobus, septimo versus apicem pluribus impressis.

Long. 6 lin.

Pangong valley.

AMARA BAMIDUNYÆ.

A. triviali (Dufts.) *affinis. Ovata, subtus viridi-ænea, supra ænea, antennis articulis 2 basalibus rufis ; pedibus nigro- vel æneo-piceis ; thorace quam in* A. triviali *breviore, basi impunctato ; elytris striis subtilibus, apice haud profundius inpressis, distincte punctulatis, interstitiis planis.*

Long. 3½–4 lin.

Pamir, between Sirikol and Panga.

AMARA AMBIGENA.

Breviter ovata, nigro-ænea polita, ventris apice rufo, palpis, antennis basi, pedibus elytrorumque epipleuris rufis ; elytris interdum castaneis ; thorace brevi, antice gradatim rotundato-angustato, apud basin elytris paulo angustiore, margine basali flexuoso, angulis posticis subacutis, foveolis basi utrinque duabus latis, sparsim grosse punctatis ; elytris brevibus, punctulato-striatis, interstitiis planis ; menti dente elongato triangulari, apice anguste fisso.

Long. 3½ lin.

Between Tanktze and Chagra, Pangong valley.

LEIOCNEMIS HIMALAICA.

Elongato-ovata, rufo-picea, supra æneo tincta ; partibus oris, antennis pedibusque flavo-testaceis ; thorace brevi, transverso, lateribus fere æqualiter arcuatis, antice paulo magis quam postice angustato, angulis posticis obtusis, lateribus paullulum explanatis, foveolis basalibus grosse sparsim punctatis, interiore rotundata, exteriore vage impressa, carinaque obsoletissima ; elytris acute et simpliciter striatis, interstitiis planis.

♂. *Tibiæ intermediæ subtus medio sinuatæ, deinde paullo dilatatæ et denticulatæ.*

Long. 3⅓ lin.

Ladakh.

LEIOCNEMIS TARTARIÆ.

Oblongo-ovata, modice convexa, nigra, polita, supra æneseens ; partibus oris, antennis pedibusque piceo-rufis ; thorace valde transverso, lateribus fortiter arcuatis, antice et postice fere æqualiter angustato, angulis posticis distinctis sed obtusis, basi utrinque foveis duabus modice impressis, fortiter punctatis ; elytris punctato-striatis, interstitiis planis ; prosterno apice late rotun-

dato, marginato; meso- et metasternis punctatis; menti dente lato, magno, bifido.

Long. 3½ lin.

Between Yangi Hissar and Sirikol.

LEIOCNEMIS FRIVOLA.

Parva, oblonga, subtus rufo-castanea, supra nigro-cænea vel cænea, elytris interdum castaneis æneo tinctis; partibus oris, antennis pedibusque rufo testaceis; thorace transversim quadrato, lateribus leniter arcuatis, postice minus quam antice angustato, mox ante basin paullulum sinuato, angulis posticis fere rectis, foveis basalibus grosse punctatis; elytris punctulato-striatis; menti dente bifido, plano.

Long. 2½ lin.

No locality. Probably near Yarkand or eastern slopes of Pamir.

AMATHITIS BADIOLA.

A. rufescenti (Dej.) *proxime affinis, at angustior corporeque infra nigro. Subtus nigra, supra capite thoraceque rufo-castaneis (illo obscuriore); elytris subfusco-badiis, interdum æneo-nitidis, striis obscurioribus; oculis multo minus quam in* A. rufescente *prominulis; thoracis angulis posticis vix rectangulis (sed apice acutis), basi tota discrete punctata, carina vix elevata; elytris punctulato-striatis, interstitiis planis; menti dente prominulo, triangulari.*

Long 4 lin.

North of Kuen-Lun. One example ticketed "Sanju."

AMATHITIS KUENLUNENSIS.

Valde elongatus, pallide ferrugineus, antennis pedibusque gracilibus, illarum articulo 3^io^ cæteris multo longiore; thorace elytris multo angustiore, late cordato, lateribus antice fortiter arcuatis, postice sinuatim angustato, angulis posticis acutis, supra impunctato, foveis basalibus latis, vagis, carinaque prope angulum indistincte elevata; elytris elongato-ovatis, apice paulo sinuatis, striis lævibus, modice impressis.

Long. 5 lin. ♀.

Sanju.

BRADYTUS COMPACTUS.

Breviter oblongo-ovatus, latus, subæneo-niger, convexus; capite brevi et crasso, oculis parum convexis, epistomatis margine antico transversim sulcato; thorace elytris haud angustiore, postice modice angustato, angulis posticis acutis, foveolis basalibus parvis, punctatis, carinaque obsoleta; elytris simpliciter striatis, interstitiis planis; palpis, antennis pedibusque rufo-piceis; menti dente magno, apice inconspicue emarginato.

Long. 4 lin.

Murree.

CURTONOTUS PAMIRENSIS.

Elongato-oblongus, angustus, rufo-castaneus, supra olivaceo-æneus.

thoracis elytrorumque marginibus reflexis rufescentibus; capite lævi, mox pone oculos angustato; thorace transversim quadrato, ante basin subfortiter constricto, ibique lateribus parallelis et margine laterali haud interrupto, angulis posticis rectis, basi grosse subsparsim punctato, foveis utrinque linearibus; elytris striatis, striis (versus apicem exceptis) punctatis.

♂ *tibiis intermediis post medium angustatis et subtus acute breviter bidentatis.*

Long. $4\frac{1}{2}$–5 lin.

Pamir, between Sirikol and Panga.

BEMBIDIUM (PERYPHUS) PAMIRENSE.

Oblongum, depressum, capite thoraceque viridi- vel aurato-æneis, politis; elytris fulvo-testaceis, vitta suturali (ante apicem abbreviata) fasciaque pone medium, interdum quoque margine et apice æneo-fuscis; antennis, palpis pedibusque flavo-testaceis; thorace breviter cordato, antice fortiter rotundato, basi rugato, angulis posticis rectis, fovea utrinque profunda carinulaque obliqua; elytris striato-punctatis, interstitiis planis.

Long. $2\frac{1}{4}$ lin.

Pamir, between Sirikol and Panga.

BEMBIDIUM (PERYPHUS) PUNCTULIPENNE.

Subdepressum, æneo-nigrum, politum, mandibulis piceo-rufis; thorace antice leniter rotundato, postice usque ad angulos angustato, his fortiter reflexis, obtusis, margine basali utrinque prope angulum valde obliquo, supra basi et margine rugulosis, fovea oblonga; elytris punctato-striatis, striis 1°–4um solum impressis, 6^{a} et 7^{a} obsoletis, interstitiis planis, minutissime sparsim punctatis.

Long. vix 2 lin.

No locality. Pamir or near Yarkand?

MOLOPS PILIFERUS.

Niger, nitidus; thorace late cordato, post medium subsinuatim angustato, angulis posticis rectis, antice juxta marginem lateralem punctis decem longe piliferis lineatim dispositis; elytris elongato-ovatis, convexis, prope apicem fortiter sinuatis, supra exarato-striatis, striis 7^{a} et 8^{a} valde approximatis, 7ma continuo punctatis, punctis longe piliferis, interstitiis dorsalibus planis, 3° et 5° apice pilifero-punctatis.

Long. 6–7 lin.

Murree.

ANCHOMENUS LADAKENSIS.

A. parumpunctato (Linn.) *proxime affinis, sed gracilior, thorace longiore, etc. Supra subfusco-cupreus, capite thoraceque magis æneis, interdum toto viridi-æneus; femoribus nigro-piceis, tibiis tarsisque rufopiceis; antennis piceo-fuscis, articulo basali rufo; thorace subquadrato, lateribus leniter arcuatis, angulis posticis rotundatis, ibique margine explanato-reflexo, toto limbo albuæeo;*

elytris elongatis, parallelis, acute striatis, interstitiis planis, tertio 5-punctato.

Long. $3\frac{1}{2}$ lin.

Between Tangtze and Chagra, Pangong valley; also Pamir, between Sirikol and Panga.

ANCHOMENUS POLITISSIMUS.

A. fuliginoso (Panz.) *forma subsimilis, nigro-æneus, politissimus; capite breviter ovato, oculis vix prominulis; palpis art. ult. acuminatis; thorace postice angustato, angulis posticis oblique rotundatis, margine prope angulum valde reflexo; elytris versus apicem valde sinuatis, supra obsolete striatis, disco utrinque haud conspicue bipunctato; pedibus æneis, tibiis rufo-testaceis.*

Long. $2\frac{1}{2}$ lin.

Murree.

COLPODES OVALICEPS.

Minus elongatus, nigro-chalybeus, nitidus; elytris ampliatis, ovatis; capite parvo, ovato, oculis haud prominulis; menti dente apice sulcato-emarginato; thorace ovato, quam caput dimidio latiore, margine laterali æqualiter explanato, subreflexo, angulis posticis subrotundatis; elytris convexis, late ovatis, apice vix sinuatis, humeris rotundatis striatis, interstitis planis, tertio tripunctato; metasterni episternis brevibus; antennis, palpis pedibusque rufo-piceis, femoribus nigris.

Long. 5 lin.

Murree.

METABLETUS TARTARUS.

M. truncatello (Linn.) *paullo major, magis elongatus, subæneo-niger, nitidus, antennis et pedibus fusco-piceis; thorace quam in* M. truncatello *magis angustato, angulis posticis obtusioribus, deinde usque ad basin magis obliquis; elytris elongatis, apice obtuse subsinuatim truncatis, obsolete striatis, impunctatis.*

Long. $1\frac{3}{4}$ lin.

Between Yangi Hissar and Sirikol.

CYMINDIS GLABRELLA.

C. andreæ (Ménétr.) *affinis, at gracilior, oculis minus prominulis, elytrisque fusco-castaneis flavo marginatis. Gracilis, glaberrima, castaneo-rufa, abdomine margine picescente, capite obscuriore, partibus oris, antennis, pedibus elytrorumque margine fulvotestaceis; capite angusto, sparsim punctulato; thorace quam caput haud latiore, anguste cordato, lateribus postice leviter sinuatis, angulis posticis fere rotundatis, subpunctulato-striatis, interstitiis sparsim punctulatis.*

Long. 4–$4\frac{1}{3}$ lin.

Ladakh.

Longicornia.

Prionus corpulentus.

♀ *magna, elongata, nigro-castanea, supra omnino coriacea vix nitida; thorace parvo, utrinque acute trispinoso; elytris versus basin parallelis, compressis, deinde modice dilatato-rotundatis, apice late obtusis; pectore toto dense fulvo-hirto; abdomine politissimo; antennis* 12*-articulatis, grosse punctatis, articulis* 3°–11um *serratis.*

Long. 24 lin.

Murree.

Hesperophanes cribricollis.

Cylindricus, fulvus, pubescentia incumbente cinereo-fulva apud elytra maculatim vestitus; thorace rotundato, elytris multo angustiore, inæquali, lateribus medio subtuberoso, supra crebre alveolato-punctato; scutello cinereo; elytris omnino discrete punctatis, haud conspicue bicarinatis, apice gradatim angustatis, subacuminatis.

Long. 8–9 lin.

Murree.

Trinophylum, nov. gen.

Gen. Hesperophani *affine, sed femoribus abrupte clavatis, oculisque minus fortiter granulatis. Corpus elongatum, subdepressum, breviter suberecte pubescens, crebre punctatum. Caput brevissimum: tubera antennifera haud elevata; palpis brevissimis. Thorax rotundatus, inermis. Elytra apice obtusa. Acetabula antica extus haud elongata. Prosternum angustum; mesosternum latum, subconvexum; metasterni episterna elongata, angusta, postice attenuata. Antennæ filiformes, corpore paullo breviores, articulo* 4to *paulo abbreviato.*

Trinophylum cribratum.

Castaneo-fuscum, subnitidum, omnino suberecte fusco-pubescens, crebre sed discrete punctatum; thorace supra antice et postice paullo depresso, linea dorsali lævi; elytris lineis duabus indistinctis, lævibus.

Long. 6½ lin.

Murree.

Leptura rubriola.

L. sanguinolentæ (Linn.) *affinis. Nigra, subtus sparsim fulvo-pilosa, thoracis plaga magna discoidea elytrisque rufo-opacis; capite et thorace reticulato-punctatis, illo paullo post oculos subito et fortiter constricto; thorace medio haud conspicue dilatato, modice convexo, angulisque posticis modice productis; elytris subcrebre punctulatis, apice recte truncatis, angulisque breviter dentatis.* ♀.

Long. 6 lin.

Murree.

CLYTANTHUS IGNOBILIS.

Cl. 4-punctato (Fabr.) *proxime affinis. Nigro-fuscus, tomento cinereo-flavo vestitus; elytris utrinque maculis* 5 *nigris, quam in* Cl. 4-punctato *majoribus, scilicet* 1 *curvata post scutellum,* 1 *parva humerali,* 1 *antico-discoidali,* 1 *mediana majore transversa et* 1 *huic proxima longitudinali oblonga.*

Long. 6 lin.

Murree.

11. On a new Species of *Notauges* (*N. hildebrandti*, Cab.). By Dr. G. HARTLAUB.

[Received June 17, 1878.]

The Museum of Natural History of Bremen has been enriched of late with a fine adult specimen of a new typical *Notauges*, discovered by the famous traveller Mr. Hildebrandt, in Eastern Africa. The exact place where he collected this interesting bird is "Tkanga in Ukamba."

Mas ad. *capite, gutture, dorso, tergo, uropygio, supracaudalibus, tectricibus alarum minoribus margineque alari chalybeis, nitore purpurascente; collo postico late et circumscripte æneo-virescente; alis duabus seriebus macularum holosericeo-nigrarum bifasciatis; tectricibus alarum majoribus viridi-æneis; remigibus primariis in pogonio externo æneo-cærulescentibus, obscure maculatis, interno nigris; tectricibus minoribus in pogonio externo unicoloribus æneo-virentibus; pectore, abdomine, cruribus et subcaudalibus cinnamomeo-rufis; subalaribus majoribus rufis, minoribus chalybeis; rectricibus cærulescenti-æneis, minus distincte undulatis; rostro et pedibus nigris; iride aurantiaco-rubra.*

Long. 19 centim., rostr. a fr. 18 mill., al. 123 mill., caud. 83 mill., tars. 30 mill.

The steel-blue colour of the head is less brilliant on the crown; there appear some rufous feathers on the uropygium; and some of the upper tail-coverts have a slight rufous terminal edging; the first primary is of a uniform blackish colour.

In *Notauges superbus* (Abyssinia, Shoa) the colouring is very different: the upper parts are brown-green, the vent and under tail-coverts are white, and there are other differences.

Mr. Hildebrandt told me that during his many excursions in East Africa he never met with *Notauges albicapillus*, Blyth. This is certainly one of the rarest birds, the Calcutta specimen collected by Speke and Burton being as yet the only one known.

12. Description of a new Batrachian from Southern India, belonging to the family Phryniscidæ. By Lieut.-Col. R. H. Beddome, C.M.Z.S.

[Received June 17, 1878.]

Melanobatrachus, gen. nov.

Toes cylindrical, not dilated at the ends; no maxillary or vomerine teeth; ear imperfectly developed, no parotids; sacral vertebra dilated; toes webbed; body slender, elongate, uniform in width; muzzle short, obtuse; fingers and toes short, metatarsus with a slightly swollen inconspicuous tubercle.

Melanobatrachus indicus, n. sp.

Body with nearly parallel sides as in *Ansonia*; no canthus rostralis, no sign of a tympanum or cavum tympani; cleft of mouth extends nearly as far back as the eyelid, the space between the nares $\frac{1}{10}$ of an inch; fingers 4, free, short, the third double as long as the others; toes 5, slightly webbed, the fourth much longer than the third. Eustachian tubes closed, tongue rounded and free behind, surface of the head and body tubercled, arms smooth, the humerus short, hind limbs tubercled, the thigh shorter than the calf; belly and sides smooth. Colour black, with minute white dots on the back and larger ones on the belly, the thighs near their junction with the body are girt with a brilliant scarlet band, $\frac{1}{4}$ inch in breadth, either continuous all round or interrupted above; and there are sometimes a few scarlet blotches on the anterior portion of the belly between the fore legs and sometimes on the lower portion of the humerus (the scarlet colour of these markings fading to cream-colour in spirits). Length of body $1\frac{1}{4}$ to $1\frac{3}{8}$ inch, length of hind limb to end of fourth toe $1\frac{1}{2}$ to $1\frac{3}{4}$ inch.

Hab. The Anamallays and the Ghat range to the south of those mountains, very rare, in moist evergreen forests of 4000 feet elevation, under old rotten logs. The specimens found were all in quite a torpid state and curled up almost into a ball, but became very active when put in spirits.

Dr. Anderson, who has kindly prepared the skeleton of one of these Batrachians, informs me that its osteology much more resembles that of *Bufo* than *Rana*; the skull is short and broad, and the frontals and parietals have considerable lateral extension; it is also edentulous, and there are no vomerine eminences; a careful examination of the sternum does not reveal the existence of any omosternum; clavicles are present. Dr. Anderson was not able to detect any tympanum under the skin; nor could he trace a tympanic cavity. He mentions that the stem of the stapes is not developed, and moreover that he could not detect any Eustachian openings in the mouth.

There are only from 8 to 9 vertebræ in *Bufo melanostictus*; and the

first vertebra, which has considerable length and breadth, is marked on its under surface by a prominent ridge which does not occur in the above-mentioned Indian toad.

The transverse processes of the sacral vertebra are dilated as in *Bufo*.

13. On *Gazella granti*. By Sir Victor Brooke, Bart., F.Z.S.

[Received June 17, 1878.]

Some years ago (*vide* P. Z. S. 1872, p. 601. pl. xli.) I had the pleasure of bringing before the Society's notice a species of *Gazella* which I supposed to be new, and upon which I conferred provisionally the name *Gazella granti*. My original description of the species was based on small water-colour sketches of the head and flat skins of a male and female obtained by Capt. Speke and Col. Grant in Ugogo, which were executed by them previous to the dispatch of the specimens to England. When writing my first notice, I believed that these specimens had been lost, there being no record of their arrival at the Society's rooms, where Capt. Speke had expressed a wish that they should be kept until his return; but Col. Grant has since informed me that they reached England safely and are still preserved along with some other objects of natural history collected by Capt. Speke, in Capt. Speke's father's house.

In 1875 Dr. Kirk presented to the Society (*vide* P. Z. S. 1875, p. 527, pl. lix.) the first living specimen of the species which had ever been exhibited in Europe. Unfortunately the animal, a very young female, arrived in very delicate health, and died shortly afterwards. It is now preserved in the British Museum (spec. 75. 12. 29. 4), whither it was transferred after Mr. Sclater's exhibition of it to the Society. It was not, however, till towards the end of last year that the first specimen of an adult male of this magnificent gazelle came under my personal observation. The animal was shot by Mr. Charles Arkwright, about 8 miles from the village of Tubugwe, which is situated, as nearly as Mr. Arkwright could ascertain, about 50 miles N.E. of Ugogo. It was one of a herd composed of about 20 individuals, amongst which there was one other old male. Mr. Arkwright has most kindly intrusted his valuable trophy to my care; so that I am enabled to exhibit it to the Society this evening, and to base upon it and upon the young female in the British Museum a fuller and more accurate description of the species than was possible at the time of my original notice.

Gazella granti.

1863. *Antilope sœmmerringii*? Speke, P. Z. S. 1863, p. 3, sp. 15.
1872. *Gazella granti*, Brooke, P. Z. S. 1872, p. 601, pl. xli.
1873. *Gazella granti*, Brooke, P. Z. S. 1873, p. 550.
1875. *Gazella granti*, Sclater, P. Z. S. 1875, p. 535.

General colour very rich fawn tinged with purple, the neck and

body in certain lights mottled like watered silk ; this pattern is gained by indefinitely bounded bands of darker hair. Central facial band [1] darker than the neck and body, and strongly tinged with rufous on the forehead. A large black patch above the nostrils. Light facial streaks very definite, white. Dark facial streak black, extending

Fig. 1.



Gazella granti.

from the base of the horn to the eye, which it almost encircles, and from the eye to above the corners of the mouth. Posterior to the eye is a small white patch. External surface of the ear-conchs streaked with dark brown. Dark lateral and pygal bands distinctly marked; the former grizzled, the latter very broad and jet-black.

[1] For a detailed definition of the terms used in this description, *vide* P. Z. S. 1873, p. 536.

Lower two thirds of the tail black, the upper third white. The tip of the tail is tufted; for the remainder of its length it is furnished with coarse hairs which project at right angles to its axis. Chin, lower surface of the head, breast, belly, inside of limbs and rump white, the white of the rump extending forwards in an angle into the darker colour of the body. Knee-brushes of moderate length,

Fig. 2.



Gazella granti.

grizzled. Horns of great length in both sexes, much compressed from side to side, marked by strong annulations which completely surround the horn for the proximal half of its length, but become obsolete on the posterior surface of its distal or upper half. The horns diverge at first gradually, then more boldly, their tips con-

verging and giving to the set of the horns a remarkably perfect lyrate form.

The skull is in every respect typically Gazelline.

Dimensions of Mr. Arkwright's head and horns (figs. 1 and 2, pp. 724, 725).

	English Inches.	Metre.
Length of horns round the curve	24·0	0·610
Length of horns in a straight line	23·0	0·580
Circumference of horns at base	6·6	0·170
Distance between the tips.....	13·0	0·330
Length of ears	6·5	0·165

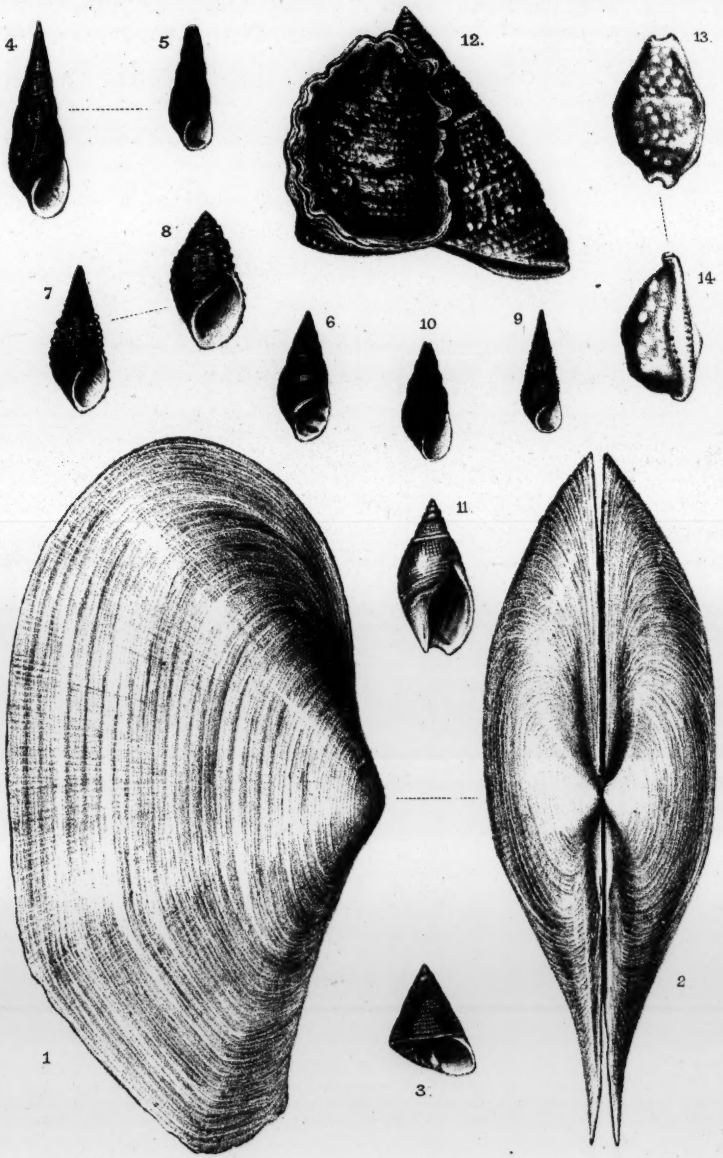
Dimensions of the young female in the British Museum, of which the dentition is d. i.$\frac{0}{3}$, d. c.$\frac{0}{1}$, d. m.$\frac{3}{3}$, m.$\frac{1}{1}$.

	English Inches.	Metre.
Height at shoulder	28·0	0·710
Length of horns.....	7·5	0·190
Length of ears	5.5	0·140
Length of tail.....		
Length of tail, exclusive of hair	6·5	0·165

The horns of the adult female shot by Capt. Speke and Col. Grant in Ugogo measured 15 inches round the curve.

Comparison with allied Species.

Gazella granti belongs, as pointed out in my former description, to the group of long-limbed large Gazelles which are distinguished by the white of the rump projecting in an angle into the fawn-colour of the back and sides (*vide* P. Z. S. 1873, p. 537, B'). The allied species are *G. sœmmerringi*, *G. mohr*, and *G. dama*. From all these it differs in the very much greater size, and in the form of the horns. It is also peculiar in the presence of the dark lateral band, which is wanting in the three above-named species, and in the remarkably definite black pygal band, which is only shown in very young specimens of *Gazella sœmmerringi*, is absent entirely in *Gazella dama*, and only indefinitely shown in *Gazella mohr*. In the watered-silk mottling of the neck and back *Gazella granti* differs from all other known Gazelles.



C. Barjeau lith.

Mintern Bros. imp.

NEW AND OTHER SHELLS FROM VARIOUS LOCALITIES.

14. Descriptions of two new Species of Shells from China and Japan. By Carl Bock, F.G.S. &c.

[Received June 18, 1878.]

(Plate XLVI.)

Tellina wroblewskyi. (Plate XLVI. figs. 1, 2.)

Shell subovate, slightly inequilateral, gaping at both ends, marked with coarse and rather distant concentric lines of growth, covered with fine radiating striæ, pellucid at intervals, with concentric opaque layers, the posterior region also being somewhat opaque. Colour bluish white stained with grey, especially at the posterior end. The latter portion is $\frac{1}{9}$ longer than the anterior, acuminately produced, and terminates in a somewhat obtuse angle. Anterior margin rounded, ventral but slightly arcuate, almost rectilinear near the middle; posterior dorsal slope deeply excavated, the valves being strongly carinate from the umbo towards the posterior extremity, with a deep excavation between the keel and the extreme margin. Cardinal teeth 2 in the left valve, 1 in the right. Anterior muscular impression very elongated near the margin, posterior irregularly quadrate. Ligament situated on a narrow ledge of the posterior dorsal slope, marked off by an incised line, and extending from the umbo nearly 20 millims. In both valves (principally towards the umbones) there are rather large and irregular pittings. Pallial sinus very deep, forming a subacute angle, which extends anteriorly beyond the umbo.

Breadth 112 millim., length 61 millim., diameter, with the valves closed, 39 millim.

Hab. China.

The magnificent species here described is one of the largest of the family (Tellinidæ), and resembles in outward appearance certain species of the genus *Anatina*.

I propose to associate with this beautiful shell the name of Dr. Wroblewsky of Copenhagen.

Trochus (Thalotia) yokohamensis. (Plate XLVI. fig. 3.)

Shell imperforate, acutely pyramidal, dull white, marked at intervals with irregular dark brown blotches, and the base ornamented with brown lines radiating from the centre (where they are paler, almost orange) to the periphery. Whorls 7, quite flat, spirally ridged; ridges crenulate or subgranular through being crossed by oblique raised striæ or lirulæ; on the upper whorls there are about six ridges, and on the last, which is acutely angled at the middle, they are about fourteen in number, that at the carina consisting of two or three small approximated ones, and hence broader than the rest. Aperture slightly oblique, subquadrate, upper half above the carina shallowly sulcate, lower portion smooth; columella white, callous, terminating in an oblique slight truncation. Greatest diameter 15 millim., length 18.

Hab. Yokohama, Japan.

15. Descriptions of five new Shells from the Island of Formosa and the Persian Gulf, and Notes upon a few known Species. By Edgar A. Smith, F.Z.S.

[Received June 18, 1878.]

(Plate XLVI.)

Melania formosensis. (Plate XLVI. figs. 4 & 5.)

Shell elongate, subulate, olivaceous yellow, purer yellow beneath the whorls, marked with longitudinal, undulating, more or less interrupted and broken flammules of a dark brown colour, at the top of the whorls forming conspicuous blotches, and at the base of the body-whorl with a broad blackish-brown band. Whorls 13, a little constricted at the upper part and submarginated and somewhat convex beneath, the first 9 or 10 obliquely costate and deeply transversely sulcate, the lowermost sulcus at the suture being particularly wide, forming a canaliculation, the last three whorls only spirally sulcate and striated by obliquely flexuous lines of growth; sulci narrower than the interstices, about 10 in the penultimate whorl and 24 in the last. Aperture ovate, acute superiorly, within of the same colour as the exterior, but clouded by a white enamel, the brown flammulation and spiral basal band being visible; columella white, oblique, but slightly arcuate.

Length 33 millim., diameter 9½; aperture 9½ long, 5 wide.

Var. In this variety the longitudinal plicæ extend as far as the penultimate whorl, and are even partially developed on the last.

Hab. Formosa (*Dickson*).

This species, which I feel much pleasure in naming after Mr. Matthew Dickson, has been liberally presented to the Museum by him, together with the other Melaniæ here described, and a numerous series of insects.

Melania dicksoni. (Plate XLVI. fig. 6.)

Shell elongate, acuminate, shining, olivaceous yellow, purplish brown at the apex, with or without spiral brown bands. Whorls 8 or 9, moderately convex, the six upper ones almost smooth, only finely striated longitudinally by lines of growth, and also transversely, the last two with a few faint transverse keels or ridges. Aperture ovate, acuminate above, occupying nearly ⅔ of the entire length, white within, the brown bands of the exterior (when present) also visible. Lip thin, almost even, not prominent or sinuated; columella rather thickly callous in the umbilical region, and united to the lip above by a very thin callosity.

Length 21 millim., diameter 8; aperture 8½ long, 5 wide.

Hab. Formosa (*Dickson*).

This is a very remarkable species, and looks more like a North-American than an Eastern form.

The brown transverse bands are present in five out of the six spe-

cimens presented to the Museum by Mr. Dickson. There are two on the penultimate whorl, one at its base, and one a little above the middle. On the body-whorl there are three, the two upper ones being continuous with those on the preceding volution, and the third at the base.

MELANIA OBLIQUIGRANOSA. (Plate XLVI. figs. 7 & 8.)

Shell elongately ovate, acuminate above, of a dirty yellowish colour, and usually coated with a black earthy deposit; spire acutely conical, with straight outlines; whorls 9–10, turreted, quite flat, obliquely plicated and spirally ridged, with nodules at the point of contact of the plicæ with the ridges; on the whorls of the spire the ridges are four in number, the granules on the uppermost one a little larger than those on the three lower ones. Body-whorl almost flat above the middle; at that point and beneath somewhat convex, encircled by 11 or 12 transverse ridges, whereof 5 or 6 of the upper ones are granuliferous, the rest either uninterrupted or displaying an indication of oblong granulations. Aperture pyriform, acute superiorly, within of nearly the same colour as the exterior, but coated with a thin smooth callous deposit occupying about $\frac{2}{3}$ of the entire length of the shell; columella considerably arcuated, at the middle white, united above to the lip by a very thin enamel on the whorl; lip thin, sinuated above and prominent below the middle.

Length 25 millim., diameter 8; aperture 10 long, 5 wide.

Var. *monstrosa*. Shell ovate; spire short; aperture more than half as long as the shell.

Hab. Formosa (*Dickson*).

This species may be recognized among the several allied forms from the Philippine Islands and other places by its very rectilinear acute spire and perfectly flat whorls. The uppermost series of granules is at a little distance beneath the sutural line; and from this circumstance the whorls have a turreted appearance. The nodules of this series are larger and fewer in number than those of the other series, and consequently do not quite regularly terminate the obsolete plicæ, upon which the other three granules are situated in an oblique direction. Some of the granules have a squarish form, others are transversely somewhat oblong; and most of them have the upper and lower margins rather straight, with the lateral edges less defined, but gradually blending off into the transverse ridges.

The colour of this species is pretty constantly uniform; one specimen, however, is marked with a few reddish dots towards the base, and these are most conspicuous within the aperture.

MELANIA TUBERCULATA, Müller. (Plate XLVI. fig. 9.)

Hab. Formosa (*Dickson*).

The shell here figured appears to be inseparable from this remarkably variable and widely distributed species.

MELANIA SUBPLICATULA. (Plate XLVI. fig. 10.)

Shell rather small, elongate, acuminate, eroded or truncate at the

apex, olive-brown, more or less coated with a black earthy deposit. Whorls probably about 9 in number, the remaining four or five slightly convex, spirally sulcate, and longitudinally sculptured with coarsish flexuous lines of growth; ridges between the sulci about 10 in the penultimate whorl and 18 in the last, those near the base separated by wider sulci than above. Aperture oval, acuminate superiorly and very slightly effuse at the base, occupying about $\frac{1}{3}$ of the supposed entire length of the shell, sordid bluish within; lip very thin, broadly sinuated above and somewhat prominent below the middle. Columella whitish, moderately arcuate.

Supposed total length 23 millim.; actual length of five remaining whorls 19, diameter $7\frac{1}{3}$; aperture $7\frac{1}{3}$ long, $4\frac{1}{3}$ wide.

Hab. Formosa (*Dickson*).

This species resembles *M. dolorosa*, Gould, to some extent; however, it is distinguishable on account of more elongated whorls and coarser spiral sulci. Some of the lines of growth here and there are well marked, and give the whorls a subplicated appearance.

Bullia persica. (Plate XLVI. fig. 11.)

Shell ovate-acuminate superiorly, greyish or lavender-colour, whitish at the upper part of the whorls, with the callous band at their base white, bordered below by a brown line at the suture; and the base or cauda of the last whorl is also white. Whorls 6, the first two smooth, convex, the rest spirally sulcated, the ridges between the sulci 8 in number in the upper whorls and about 16 in the last, whereof 12 are above and 4 below the acute ridge or keel, which winds round the lower portion of the whorl. Of these ridges the four immediately below the suture are more or less white, granulous through being crossed by oblique sulci, which only extend from the suture a short distance. Aperture deep brown within, with a paler or white border at the outer lip and over the basal sinus, and a little longer than the spire. Columella moderately arched, and coated with a thinnish white enamel. Basal sinus rather broad and deep.

Length 24 millim., diameter 10; aperture 12 long, 7 broad.

Hab. Bushire, Persian Gulf.

Two specimens of this very interesting species have recently been presented to the Museum by Mr. A. S. Betts. The peculiar form and colouring, the granular ridges at the upper part of the whorl, and the brown aperture with the white margin to the labrum and basal sinus are the most obvious distinguishing characters of the species.

Ostrea, sp., adhering to *Trochus* (*Polydonta*) *maculatus*, Linn. (Plate XLVI. fig. 12.)

This is a remarkable instance in which a shell has assumed, to a certain extent, the sculpture of another to which it has adhered. This assumption or mimicry of the surface of other shells and foreign substances has already been noticed in other species of *Ostrea* and other genera, and is common to most forms of the genus *Myochama*. The same process which effects so remarkable a change in the normal

aspect of the latter, namely the moulding of the edges of the upper valve by the animal to the surface of the substance to which the shell is attached, no doubt, was employed by the Oyster here figured; for I do not think that this alteration of outward appearance has been in any way effected by contact of the tentacular cirri which proceed from the edge of the mantle of the *Trochus*, because if this were the case some alteration in colour would have been expected.

The lower valve is white both externally and within, and, being thin, does not conceal the granular surface of the *Trochus* upon which it rests. The upper valve is olive-green within, and smooth, with the exception of the pear-shaped muscular scar and a few small granules scattered all round the margin. The exterior is dark lilac, with six obscure brownish rays, most observable towards the margin, and terminating at the digitations or prolongations at the edge.

The lamellated surface, so common to the upper valves of most Oysters, is almost altogether obliterated, and only here and there traces of it are noticeable. The exterior is rather smooth, subangular, the indistinct granules arranged in series corresponding to those on the *Trochus*; and the sucure dividing the last and the penultimate whorls, and a depression or sulcus round the middle of the former, are also reproduced. The specimen is in the collection of Mr. Carl Bock.

CYPRÆA PEASEI, Sowerby. (Plate XLVI. figs. 13 & 14.)

Cypræa peasei, Sowerby, Thesaurus Conchyl. iv. pl. 311. figs. 167, 168.

Hab. Mauritius. Coll. Carl Bock.

The shell here figured appears to be a monstrous growth of this species. The alteration of form and the obtuse ridges on the dorsal surface are suggestive of certain forms of the genus *Ovulum*.

CONUS PASTINACA.

Much uncertainty and confusion exists with regard to the determination of this Lamarckian species. The original description of it is so brief that it is absolutely impossible ever to know with certainty what species Lamarck really had before him, more especially as the actual type (which has been lost) was never figured by him, nor does he refer to any previously published figure. The shell described and delineated by Kiener (Coq. Viv. pl. 26. fig. 2) certainly cannot be the true *C. pastinaca*. The species there represented (unknown to me) is decidedly distinct. The character of the spire does not at all agree with Lamarck's description, which is as follows:—"spira obtusa, immaculata, submucronata;" and again in French: "à spire non tachée." Kiener's shell has a rather concavely elevated spire and fulvous blotches upon it.

Reeve's iden of *C. pastinaca*, figured (Conchol. Icon. i. pl. 46. fig. 257, copied by Sowerby, Thesaurus Conchyliorum, iii. pl. 201. fig. 353) from a specimen in the British Museum, is also an erroneous one. This shell I have very carefully examined, and unhesi-

tatingly pronounce it to be a bleached example of *C. virgo*; for in form and sculpture it is absolutely identical with certain specimens of that species, and differs only in colour. This variation may be due to bleaching; or it may possibly be an albino form. The purple base, which is so constant a character in this species, is traceable in a faint degree in Reeve's shell. He does not refer to this in his description; yet in the figure it has been represented by the artist.

The species figured by Weinkauff in Kuster's Conchilien-Cabinet, pl. 32. figs. 1 and 2, apparently is the same as or very closely allied to that depicted by Reeve.

In order to come to some decision in the matter, I commuicated with Dr. Brot, of Geneva, asking him for information respecting Lamarck's species, as his types in Delessert's collection have recently been obtained by the museum of that city. Unfortunately, it appears that Lamarck's Cones are not marked as in other genera, but placed on tablets bearing the designation L. According to a catalogue of Delessert's collection, Dr. Brot informes me that there ought to be five specimens of *C. pastinaca*; but only four are now to be found; the fifth (possibly that figured by Kiener) had disappeared before the collection reached Geneva. Of the remaining four, three existed in Lamarck's cabinet. None of these, however, has the dimensions indicated by that author. Two are considered by Dr. Brot small specimens of *Conus quercinus*; for they are ornamented (indistinctly, however) with the fine thread-like brown lines which are characteristic of that species. The third shell he considers a diminutive specimen of that figured by Kiener; for it so resembles the figure, that at first he thought that it had been enlarged for Kiener's plate. Finally, the fourth specimen of *C. pastinaca*, which is not from Lamarck's collection, resembles the form figured by Reeve under this name. Thus it appears that, under the name of *C. pastinaca*, the Delessert collection contains three species, viz. the *C. pastinaca* of Kiener (young), that of Reeve, also young, and, lastly, two small specimens of *Conus quercinus*. The question which now has to be settled is this:—Is the specimen in Delessert's collection, which is similar to Reeve's figure, really the same species as that delineated? if not, may it not be the true *pastinaca*?

In the British Museum the shell which accords most closely with the Lamarckian diagnosis is a worn specimen of *C. tabidus*, Reeve, figured in the 'Conchologia Iconica' under the name of *C. hepaticus*, Kiener (Conch. Icon. Suppl. pl. viii. fig. 278).

EXPLANATION OF PLATE XLVI.

Figs. 1, 2. *Tellina wroblewskyi*, p. 727.
3. *Trochus* (*Thalotia*) *yokohamensis*, p. 727.
4. *Melania formosensis*, p. 728.
5. —— *formosensis*, var., p. 728.
6. —— *dicksoni*, p. 728.
7. —— *obliquigranosa*, p. 729.
8. —— *obliquigranosa*, var., p. 729.
9. —— *tuberculata*, p. 729.

Fig. 10. *Melania subplicatula*, p. 729.
11. *Bullia persica*, p. 730.
12. *Ostrea*, attached to a *Trochus*, whose character of sculpture it has assumed, p. 730.
13, 14. *Cypræa peasei*, var. *monstrosa*, p. 731.

16. Descriptions of some apparently new Species of Butterflies from New Ireland and New Britain, sent by the Rev. G. Brown. By F. D. Godman and O. Salvin.

[Received June 18, 1878.]

The five species described below form part of a collection just received from Mr. G. Brown. We are preparing a full report of this collection, which we hope to lay before the Society in the autumn. In the mean time we have thought it desirable to publish the following descriptions.

Euplœa erimas.

♂. Exp. 3·7. Upper surface rich steel-blue, a large patch of bluish white on the primaries cut by the dark median nervure and its branches and by the nervules at the end of the cell; there is a dark triangular spot in the acute angle between the median nervule and its first branch; the inner margin of the primaries is strongly convex, and covers a brown patch on the secondaries; the secondaries have a whitish median band cut by the nervules, one section falling inside the cell; the inner edge of this band is deeply sinuated, as also is the outer edge to a less extent.

Beneath greenish black, the spots of the upper surface are much more broken up, that on the primaries being divided into eight separate portions, the largest of which lies just within the cell; that on the secondaries is broken into eleven portions, one of which occupies the end of the cell.

Hab. New Ireland.

Obs. Allied to *E. jessica* from the Fiji Islands, and more remotely to *E. eupator*, Hew., from Celebes. From the former it differs in having the markings on the upper surface bluish white instead of yellow, and the spot on the upper wing is not broken into two as shown in Mr. Butler's figure (Lep. Ex. pl. 8. fig. 3).

Pieris madetes.

♂. Exp. 3·5. Above uniform orange, apex and costa of primaries black.

Primaries beneath black, a large spot at the end of the cell and seven large elongated submarginal spots yellow; a pale yellowish patch spreads from the inner margin over the median branches to just within the cell; secondaries orange, base and outer margin black, the latter including a row of six large yellow spots; a large red spot between the costal and subcostal nervures near their origin.

♀. Exp. 3·8. Above, primaries black, a large yellowish spot at

the end of the cell and six submarginal spots running from the costa to the anal angle, those nearest the latter nearly white; the central portion and inner margin of secondaries dull yellowish white, the base and outer margin broadly black, the latter including six obsolete yellowish spots.

Beneath like the male, except that the primaries have no yellowish spot spreading from the inner margin over the median branches.

Hab. New Ireland.

Obs. Belongs to the *Delias* group. The male resembles on the upperside the same sex of *P. aruna*, Boisd., as figured by Hewitson, and *D. inferna*, Butl. The female on the upperside, and both sexes on the under, more nearly resemble *P. descombresi*, Boisd.

PIERIS EURYGANIA.

♂. Exp. 3·2. Above white, the apex of the primaries chrome-yellow, margined with the black costa and outer margin and a curved band running from inside the cell to near the anal angle, the outer margin of the secondaries broadly black.

Beneath, primaries chiefly black, yellow apical spot as on the upperside, the proximal end of the cell yellow, and the inner margin white; the secondaries at the basal half yellow, black towards the distal half, across the black a distinct band of crimson, which becomes orange where it meets the yellow near the inner margin.

♀. Like the ♂, except that the basal portion of the primaries is black, the outer margin of the secondaries is more broadly black, and the inner portion of the secondaries, together with inner margin of the primaries, pale yellow.

Beneath same as the male.

Hab. New Ireland.

Obs. This is a very distinct species, apparently belonging to the *Delias* group.

PIERIS LYTÆA.

♀. Exp. 2·5. Above black, a large subtriangular spot on the inner margin, extending to just within the cell, three apical spots of the primaries and the basal half of the secondaries white.

Beneath, black arranged as above, a submarginal row of large white spots on both wings; the base of the primaries and the greater portion of the base of the secondaries sulphur-yellow; the rest of the secondaries (not occupied with black) is white.

Hab. New Britain.

A female, apparently belonging to the *Belenois* group; we have no nearly allied species with which to compare it.

PAPILIO SEGONAX.

♂. Exp. 4·6. Primaries slightly falcate, secondaries produced. Upper surface rich metallic green, a median row of five nearly circular spots starting from the apex to the space between the third and fourth median nervules, a similarly coloured subtriangular spot near the middle of the inner margin, and a very small one close

inside the submedian nervure. The proximal half of the secondaries greyish white, rather darker towards the anal angle.

Beneath umber-brown, the outer portion of both wings rather darker, the spots on the primaries as above.

Hab. New Ireland.

Obs. Allied to *P. codrus*, from which it differs in having the band of spots of the primaries interrupted, there being no spots in the spaces between the first and second, and second and third median branches, that between the first median branch and the submedian nervure being wanting. On the other hand, there is a spot on the inner margin of the primaries not usually seen in *P. codrus*. The single specimen sent by Mr. Brown has the secondary wings slightly injured, so that the prolongation of the second median branch, common to all the allied species of the *P.-codrus* group, is broken off.

17. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. XII. The Procellariidæ. By Osbert Salvin, M.A., F.R.S., &c.

[Received June 18, 1878.]

Eighty specimens of Procellariidæ are comprised in the 'Challenger' collection, belonging to 22 species and 13 genera. The greater part of these were obtained during the visit to Kerguelen Island; others were secured at sea in the South Pacific Ocean, a few near the Straits of Magellan, at Nightingale Island, and elsewhere. None of the species present any difficulty as regards their nomenclature; but I take this opportunity of adding a few notes on this subject gathered during recent study of the species to which they belong.

Oceanites oceanicus.

Procellaria oceanica, Kuhl, Beitr. p. 136, pl. x. f. 1.

Oceanites oceanica, Coues, Pr. Ac. Phil. 1864, p. 82; Salv. Orn. Misc. ii. p. 227.

a–c. Males. } Ice Barrier.
d, e. Females. }

"Obtained on the 14th February, 1874."

Fregetta grallaria.

Procellaria grallaria. Vieill. N. Dict. d'Hist. N. xxv. p. 418.

Fregetta grallaria, Bp. Consp. ii. p. 197; Coues, Pr. Ac. Phil. 1864, p. 86.

Thalassidroma leucogastra, Gould, Ann. & Mag. N. H. xiii. p. 367, et B. Austr. vii. pl. 63.

568–571. Females. } South Pacific.
572, 573. Males. }

"Eyes brown. Shot on the 11th November, 1875, at sea. Their

stomachs were filled with a yellow oil, and mixed with it some pieces of Crustacea."

I am strongly disposed to add to the above synonyms *Thalassidroma gracilis*, Elliot, Ibis, 1859, p. 391, and *T. segethi*, Phil. & Landb. Arch. f. Naturg. 1860, p. 282, names admitted by many authors to apply both of them to a species found on the Chilian coast. I have seen specimens of the present species in the Paris Museum from the same locality; and the Challenger specimens now before me were obtained at sea at no great distance from the same shore; so that on geographical grounds their identity is a reasonable supposition. The chief, if not the only discrepancy I can find between the description of *F. gracilis* and *F. grallaria* is one of dimensions, the former being considerably smaller (as shown by Mr. Elliot's measurements) than the 'Challenger' birds. Thus we have:—

	Wing. in.	Tarsus. in.	Tail. in.
F. gracilis	5·22	2·40	1·20
F. grallaria	5·9–6·3	2·9–3·0	1·3–1·4

T. segethi seems to be intermediate in dimensions; but so far as the description goes, its identity with *F. grallaria* is obvious.

Mr. Sharpe (Zool. Kerg., Aves, p. 31) suggests that *P. leucogastra* may prove to be a stage of plumage of *P. melanogaster*; but I cannot think that this will ever turn out to be the case.

FREGETTA MELANOGASTRA.

Thalassidroma melanogastra, Gould, Ann. & Mag. N. H. xiii. p. 367, et B. Austr. vii. pl. 62.

a. Betsy Cove, Kerguelen.

Mr. Sharpe (Zool. Kerg., Aves, p. 30) unites *T. tropica*, Gould, with this bird, and calls it by the last-mentioned name. They may be identical; but in any case the adoption of the name *tropica* in place of *melanogastra* cannot be justified, as the latter, having been in use for over thirty years, ought not to be supplanted by the former, the two having been published simultaneously on opposite pages of the same publication!

PELAGODROMA MARINA.

Procellaria marina, Lath. Ind. Orn. p. 410.
Pelagodroma marina, Salv. Orn. Misc. ii. p. 228.

a–c. Nightingale Island.

"Eyes black; a night-bird. These were taken out of holes in the ground during the day by help of the dogs."

THALASSŒCA GLACIALOIDES.

Procellaria glacialoides, Smith, Ill. Zool. S. Afr. pl. 51.
Thalassœca glacialoides, Coues, Pr. Ac. Phil. 1866, p. 30.

a. Male. Ice Barrier.

"Obtained on the 26th February, 1874."

THALASSŒCA ANTARCTICA.

Procellaria antarctica, Gm. Syst. Nat. i. p. 565.
Thalassœca antarctica, Coues, Pr. Ac. Phil. 1866, p. 31.

a. Male. Ice Barrier.
Obtained on 14th January, 1874.
b. Male. } Ice Barrier.
c, *d*. Females. }
Obtained on the 14th January, 1874.

ADAMASTOR CINEREUS.

Procellaria cinerea, Gm. Syst. Nat. i. p. 563.
Adamastor cinereus, Coues, Pr. Ac. Phil. 1864, p. 119.

565. Female. } South Pacific.
566. Male. }
"Eyes hazel; feet flesh-colour: the stomach of one was full of the beaks of Cuttlefish; stuff from the ship in the other, and small crustacea."
"Obtained on the 5th November, 1875.

MAJAQUEUS ÆQUINOCTIALIS.

Procellaria æquinoctialis, Linn. Syst. Nat. i. p. 213.
Majaqueus æquinoctialis, Coues & Kidder, Bull. U.S. Nat. Mus. No. 2, p. 25; Sharpe, Zool. Kerg., Birds, p. 19.

a–d. Males. } Kerguelen.
e. Female. }

OSSIFRAGA GIGANTEA.

Procellaria gigantea, Gm. Syst. Nat. i. p. 563.
Ossifraga gigantea, Coues, Pr. Ac. Phil. 1866, p. 32.

567. Female. South Pacific.
"Bill yellowish green, feet black."
Obtained on the 5th November, 1875.
a. Betsy Cove, Kerguelen.

PAGODROMA NIVEA.

Procellaria nivea, Gm. Syst. Nat. i. p. 562.
Pagodroma nivea, Coues, Pr. Ac. Phil. 1866, p. 160.

a, *b*. Females. Ice Barrier.
"Obtained on the 14th January, 1874."

DAPTION CAPENSIS.

Procellaria capensis, Linn. Syst. Nat. i. p. 213.
Daption capensis, Coues, Pr. Ac. Phil. 1866, p. 163.

a. Antarctic Sea.
"Shot in April 1874."

ŒSTRELATA LESSONI.

Procellaria lessoni, Garn. Ann. Sc. Nat. 1826, vii. p. 54.
Œstrelata lessonia, Coues, Pr. Ac. Phil. 1866, p. 142; Coues &

Kidd. Bull. U.S. Nat. Mus. No. 2, p. 27; Sharpe, Zool. Kerg. Birds, p. 26.

a, *b*. Males. Betsy Cove, Kerguelen.
c–f. Females. Betsy Cove, Kerguelen.
"Eyes black."

During a recent visit to the Paris Museum I had an opportunity of examining the type of *Œ. sericea*, concerning which I had occasion to publish some notes in 'The Ibis' for 1875 (p. 373). On seeing this type I at once recognized a specimen of *Œ. lessoni*! *Œ. sericea* (Less.), placed in the genus *Adamastor* by Bonaparte and Coues, has therefore no existence as a species distinct from *Œ. lessoni*.

ŒSTRELATA MOLLIS.

Procellaria mollis, Gould, Ann. & Mag. N. H. xiii. p. 363.
Œstrelata mollis, Coues, Pr. Ac. Phil. 1866, p. 150.

a, *b*. Nightingale Island.
"Eyes hazel. Night bird. Obtained on the 17th of October, 1875."

ŒSTRELATA BREVIROSTRIS.

Procellaria brevirostris, Less. Man. d'Orn. ii. p. 611.
Œstrelata brevirostris, Salv. Orn. Misc. ii. p. 235; Sharpe, Zool. Kerg., Birds, p. 24.
Œstrelata kidderi, Coues, Bull. U.S. Nat. Mus. No. 2, p. 28.

a. Young. Kerguelen.

The species included in Cabanis and Reichenow's paper on the Birds collected by the 'Gazelle' (J. f. Orn. 1876, p. 329) under the name *Procellaria mollis*, belongs here. Last year I examined in Berlin the specimen brought home by the 'Gazelle,' and found it to belong to this species.

The 'Challenger' specimen is quite young, but interesting, as showing that these birds moult at once from the downy plumage into the feathering of the adult bird.

PRION DESOLATUS.

Procellaria desolata, Gm. Syst. Nat. i. p. 562.
Prion desolatus, Gray, H.-list. iii. p. 108; Sharpe, Zool. Kerg., Birds, p. 37 (excl. syn.).
Pseudoprion desolatus, Coues, Bull. U.S. Nat. Mus. No. 2, p. 32.

a. Male. Betsy Cove, Kerguelen.
Obtained 11th January, 1874.
"Eyes black."
b–e. Males. Betsy Cove, Kerguelen.
"Eyes black."
f. Female. Ice Barrier.
Obtained on the 14th February, 1874.
g, *h*. Females. Betsy Cove, Kerguelen.

Of the eight specimens of this species brought home by the ex-

pedition, five are males and three females. They thus offer an opportunity of testing the view advanced by Mr. Sharpe as to the supposed sexual difference in the size of the bill existing in these birds[1].

In these specimens there is no tangible difference between the bills of the sexes; and as the opposite sexes of *P. banksi*, as shown by the two 'Challenger' specimens, are also alike as regards the size of the bills, doubts may fairly be raised whether the great difference observable in the size of the bills in these birds is a sexual character at all.

PRION BANKSI.

Pachyptila banksi, Smith, Ill. Z. S. Afr. Birds, pl. 55.
Pseudoprion banksi, Coues, Pr. Ac. Phil. 1866, p. 166.

a. Male. Marion Island.
"Eyes brown."
b. Female. "Caught at sea near Crozets."

Without attempting to decide the question as to how many species of *Prion* exist, I use the name *P. banksi* for these birds, as their bills agree most nearly with that of the type of *P. banksi* in the British Museum.

PELECANOIDES URINATRIX.

Procellaria urinatrix, Gm. Syst. Nat. i. p. 560.
Pelecanoides urinatrix, Coues, Pr. Ac. Phil. 1866, p. 190; Sharpe, Zool. Kerg., Birds, p. 14.

a. Male. Kerguelen.
"Eyes dark grey."
b. Male. Betsy Cove, Kerguelen. Obtained January 1874.
c. Male. Christmas Harbour, Kerguelen.
d. Male. Betsy Cove, Kerguelen.
e–h. Females. Kerguelen.
i. Kerguelen.
j. Young. Kerguelen?

PELECANOIDES GARNOTI.

Puffinuria garnoti, Less. Voy. Coq. Zool. pl. 46.
Pelecanoides garnoti, Coues, Pr. Ac. Phil. 1866, p. 190.

639. Female.
640. Male? } Cove Harbour, Messier Channel.

"Eyes hazel. These birds and another one which was put in spirit were found dead. Two were picked up by the boat in which Captain Maclear and I went, floating on the surface of the water; and the third was picked up by the galley on the rocks. They were quite fresh; the bodies were very thin.

"Their stomachs were filled with small leaves. It looks very much

[1] Latham seems to have been the first author who mentioned this supposed sexual difference in *Prion*. After describing *P. vittatus* (Syn. iii. p. 414), he adds:—"The *female* has the same plumage; but the bill, though greatly exceeding that of any other Petrel, is scarcely more than half the breadth of that of the "*male*."

as if these birds had got out of their region. Mr. Moseley says he saw what he supposed to be one of these birds on Penguin Island."

DIOMEDEA EXULANS.

Diomedea exulans, Linn. Syst. Nat. i. p. 214; Coues, Pr. Ac. Phil. p. 866, p. 175; Coues & Kidder, Bull. Nat. Mus. No. 2, p. 11; Sharpe, Zool. Kerg., Birds, p. 45.

574. Kerguelen.

DIOMEDEA BRACHYURA.

Diomedea brachyura, Temm. Pl. Col. 554; Coues, Pr. Ac. Phil. 1866, p. 177.

517–519. Males. } North Pacific.
520. Female. }

"These were all caught with the hook from the ship while at sea in June and the first half of July 1874, between Japan and Honolulu; they followed the ship every day in numbers till we got into the trade-winds, when no more were observed."

509. Female. North Pacific.

"Eyes brown, bill black, stomach empty. Shot on the 1st April, 1875, by Lord Campbell, with the Henry rifle, while on the wing. We were just north of the tropic; but this bird, as well as another Albatross, were seen some days before we had passed out of the tropics."

511. Male. North Pacific.

"Eyes brown, feet and bill dark or nearly black; stomach had cuttlefish. Caught with a hook by Percy on the 7th April, 1875."

DIOMEDEA MELANOPHRYS.

Diomedea melanophrys, Temm. Pl. Col. 456; Coues, Pr. Ac. Phil. 1866, p. 181; Sharpe, Zool. Kerg., Birds, p. 46.

Male. } Shot at sea, 8th July, 1874.
Female. }
Male. } Christmas Harbour, Kerguelen.
Female. }

DIOMEDEA FULIGINOSA.

Diomedea fuliginosa, Gm. Syst. Nat. i. p. 595; Sharpe, Zool. Kerg., Birds, p. 48.

Phœbetria fuliginosa, Coues, Pr. Ac. Phil. 1866, p. 186; Coues & Kidder, Bull. Nat. Mus. No. 2, p. 21.

Male. See Barnier, 16th February, 1874.
Female. Royal Sound, Kerguelen, 17 January.

18. Liste des Antilopes d'Angola. Par J. V. Barboza du Bocage, F.M.Z.S.

[Received June 17, 1878.]

La présente liste des espèces d'Antilopes observées en Angola a été dressée d'après les exemplaires qui existent au Muséum de Lisbonne. La plupart de ces individus ont été recueillis dans l'intérieur de Mossamedes et au Humbe, sur la rive droite du Cunene, par notre infatigable explorateur M. de Anchieta.

1. Gazella euchore (Forst.).

Une paire d'individus adultes envoyés de Huila par M. de Anchieta. Le blanc de la tête, de l'abdomen et des membres est remplacé chez la femelle par une teinte uniforme d'un fauve-jaunâtre pâle.

2. Æpyceros petersi, sp. nov.

Nous possédons également une paire d'individus adultes de cette espèce, qui nous semble nouvelle. Le mâle, que nous avions reçu d'abord, nous avait paru identique à l'*Æpyceros melampus* d'après un premier examen ; mais ayant reçu plus tard la femelle, nous avons été frappé de quelques particularités de coloration qui nous semblent autoriser leur distinction spécifique. Nous commencerons donc par donner un rapide aperçu des caractères de la femelle.

Pelage d'un roux-fauve, plus pâle sur les flancs et la face externe des membres ; menton, gorge, poitrine, ventre et partie interne des cuisses et de l'avant-bras d'un blanc presque pur. La tête porte sur un fond de la couleur du dos quelques marques très-caractéristiques : le dessus du chanfrein, une bande au travers de l'œil et une tache en fleur-de-lys sur le front d'un noir profond ; au devant de l'œil une bande blanche bien distincte. Oreilles longues, arrondies à la pointe, d'un roux-fauve en dehors, revêtues de poils blancs en dedans, avec un espace noir à l'extrémité, plus large en dehors qu'en dedans. Queue longue, de la couleur du dos à la base, le reste blanc, marquée en dessus d'une bande longitudinale noire, à laquelle vient aboutir de chaque côté une autre bande étroite de la même couleur qui s'étend sur les fesses. Un trait noir coupant verticalement la face antérieure du genou, une tache de la même couleur à la pointe du jarret. Aux membres postérieurs, de chaque côté de l'extrémité inférieure du canon, une brosse de poils noirs. Point de mufle et point d'onglons. Deux paires de mamelles.

Dimensions.	mètre.
Du bout du museau à la base de la queue	1·30
Hauteur au garrot	0·80
Longueur de la tête	0·29
Longueur de l'oreille	0·17
Longueur de la queue	0·38

Chez notre individu mâle, plus jeune que la femelle, nous remarquons des cornes en forme de lyre fortement annelées sur leur tiers inférieur. Il présente quelques légères différences de coloration. La teinte des parties supérieures est d'un bai-roux plus foncé et le blanc des parties inférieures moins pur, plus lavé de jaune-isabelle; le dessin de la tête ressemble à celui de la femelle, quoique le noir y soit plus rembruni. Malheureusement une portion de la peau de la région frontale à été détruite par suite du coup qui l'a tué, de sorte qu'on ne peut pas constater le présence de la tache noire si nettement indiquée sur la région frontale de la femelle.

Les cornes portent trois bourrelets étroits mais saillants sur leur tiers inférieur, supérieurement elles sont lisses et arrondies; leur courbure est simple, à convexité en dehors et à pointes convergentes.

Dimensions du mâle.	mètre.
De l'extrémité du museau à la base de la queue	1·20
Hauteur au garrot	0·70
Longueur de la tête	0·25
Longueur de l'oreille	0·15
Longueur de la queue	0·35
Longueur des cornes	0·29

Le mâle nous vient de Capangombe, la femelle du Humbe, tous les deux par M. d'Anchieta[1].

3. NANOTRAGUS TRAGULUS (Forst.)?

Nous rapportons avec hésitation à cette espèce une jeune femelle que M. d'Anchieta nous a envoyée du Humbe en 1874. Voici ses principaux caractères:—

Pelage d'un roux-fauve, plus pâle sur les flancs et les membres; gorge et ventre d'un blanc pur; front et chanfrein de la couleur du dos; les joues d'une teinte plus pâle; tour des yeux blanchâtre; une tache brune en forme de fer à cheval sur le front; une autre petite tache triangulaire brune sur le chanfrein immédiatement au-dessus du mufle, qui est petit. Oreilles très-longues, légèrement acuminées, grises en dehors, blanches en dedans avec un liséré brun sur les bords. Point de brosses aux genoux; point d'onglons; queue, incomplète, de la couleur du dos. Quatre mamelles.

Dimensions.	mètre.
De l'extrémité du museau à la base de la queue	0·75
Hauteur au garrot	0·45
Longueur de la tête	0·14
„ de la l'oreille	0·11

[1] La figure qui accompagne cette note permettra de bien juger les caractères de coloration de la femelle. Notre ami le Prof. Peters, à qui nous l'avons communiquée, penche à croire, comme nous, qu'il s'agit d'une espèce nouvelle.

4. Neotragus saltianus (Blainv.).

Des individus de Capangombe et du Humbe, sur la rive droite du Cunene, par M. d'Anchieta.

5. Cephalophus grimmius (Linn.).

Une paire d'individus adultes et un jeune mâle de Capangombe par M. d'Anchieta.

Il y a même au Muséum d'autres individus de cette espèce provenant d'Angola, mais dont on ignore la localité où ils auraient été pris; quelques uns de ces individus ont vécu pendant quelques années au Jardin du Palais de Necessidades appartenant à sa Majesté le Roi Ferdinand, et s'y sont même reproduits.

Tous nos individus nous semblent appartenir par leur système de coloration à la variété dont le Dr. Gray a fait une espèce distincte sous le nom de *Grimmia splendidula* (Proc. Zool. Soc. Lond. 1871, p. 590). Nous les avions d'abord rapportés au *C. burchellii* (Journ. Acad. Sci. Lisboa, ii. p. 222).

6. Cephalophus monticola (Thunb.).

Deux individus, mâle et femelle, rapportés de Benguella par M. Freitas Branco; un individu mâle envoyé de Loanda par M. Toulson.

7. Cephalophus anchietæ, sp. nov.

Une paire d'individus adultes et une jeune femelle capturés à Capangombe par M. d'Anchieta.

Caractères :—Brun-cendré; les flancs, l'avant-bras et les cuisses d'une teinte plus pâle et plus cendrée; dessus de la tête d'un cendré noirâtre, avec une touffe de poils noirs entre les cornes; côtés de la tête et du cou de la couleur des flancs; raie sourcilière roussâtre; menton, gorge, poitrine, ventre et face interne des avant-bras et des cuisses d'un blanc pur; face antérieure et externe des membres d'un cendré lavé de fauve; queue très-courte, d'un noir profond en dessus; la région anale de cette même couleur. Cornes effilées.

Dimensions.	mètre.
De l'extrémité du museau à la base de la queue	0·58
Longueur de la tête	0·14
Hauteur au garrot.....	0·33
Longeur de l'oreille	0·07
,, de la queue.....	0·07

La teinte générale est plus rembrunie chez la jeune femelle, les membres sont plus lavés de fauve à leur partie inférieure, le dessus de la queue et la région anale d'un brun foncé.

Nos individus doivent ressembler sans doute à *C. melanorrhous*,

Gray, de Fernão do Pó, que nous connaissons à peine d'après la planche publiée dans *Knowsley Menagerie* (Gray, Knowsl. Ménag. p. 11, pl. 10); ils en diffèrent cependant par le moins d'étendue du noir, qui couvre à peine le dessus de la queue et la région anale, tandis que chez le *C. melanorrhous* la croupe est aussi de cette couleur. À juger d'après les figures du Dr. Gray, cette espèce aurait une queue plus longue que la nôtre et des cornes moins effilées. Malheureusement le Dr. Gray dans ses diverses publications sur les Antilopes a presque toujours oublié de nous donner les dimensions des individus qu'il décrit.

8. Cephalophus ruficrista, sp. nov.

C. longiceps, Bocage, Jorn. Acad. Sci. Lisboa, ii. p. 220.

Cette espèce se trouve à peine representée au Muséum de Lisbonne par une tête, recouverte de sa peau, envoyée en 1869 de Loanda par M. Toulson, sans s'accompagner d'aucune indication au sujet de sa provenance.

Nous avions d'abord pensé qu'elle pourrait bien être identique à *C. longiceps*, Gray, espèce établie exclusivement d'après les caractères ostéologiques d'une tête recueillie au Gabon par Du Chaillu (Proc. Zool. Soc. 1865, p. 204); aujourd'hui nous revenons sur nos pas, car notre première affirmative nous semble trop hasardeuse.

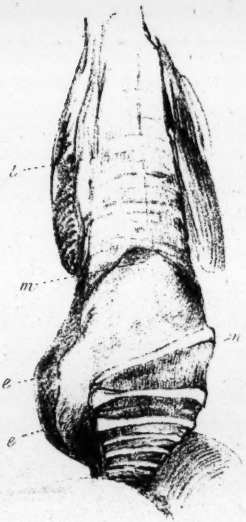
Le spécimen du Muséum de Lisbonne ressemble aussi par ses couleurs à la figure du *C. niger*, publiée par le Dr. Gray dans *Knowsley Menagerie*, pl. 7. Cependant, même sous ce rapport, leur identité specifique ne nous paraît pas évidente, et à cela vient encore s'ajouter une différence sensible dans les dimensions d'après les chiffres publiés par Temminck. Nous trouvons dans les *Esquisses de Mammalogie* de cet auteur que la distance du bord antérieur de l'œil à la pointe du nez chez *C. pluto* (= *C. niger*, Gray) est de 4 pouces et 4 lignes, et en mesurant cette distance sur la tête d'Angola nous constatons qu'elle dépasse 5 pouces; elle est de 14 centimètres.

La face supérieure le la tête est d'un brun clair sur le chanfrein et d'un brun foncé, couleur chocolat, sur le front; les faces latérales, en haut d'un gris brunâtre, deviennent blanchâtres en se rapprochant du menton, où le blanc domine; une raie sourcilière brun-jaunâtre; une tache allongée de la même couleur au-dessous de l'œil se prolongeant vers le chanfrein; tour des yeux brun-foncé; ligne muqueuse légèrement courbe et horizontale. Sur le front un toupet abondant de poils bruns et d'un roux ardent, en partie couchés sur les cornes, en partie s'élevant verticalement au milieu de ces appendices; la touffe verticale est composée de poils longs de 7 centimètres d'un roux vif, les deux touffes latérales sont formées de deux ordres de poils, les uns courts et bruns, les autres longs et roux. Les oreilles sont petites, mesurant moins de la moitié de la longueur totale de la tête; elles sont arrondies au bout, couvertes en dehors de poils très-courts et clair-semés, nues en dedans avec une large bande marginale de poils blanchâtres. Les cornes arrondies, à peine rugueuses à la

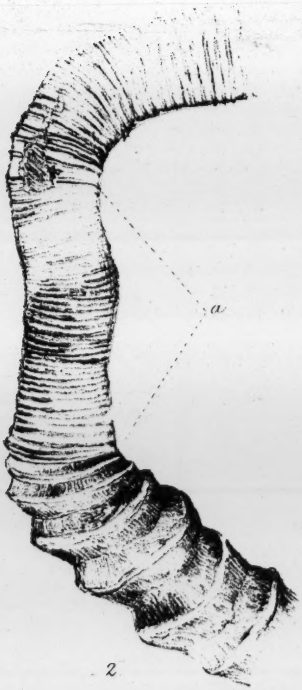




1



4



2



6



7



5

TRACHEA OF RHYNCHÆA BENGALENSIS

base, sont couchées en arrière et placées sur le plan du front; elles ont 10 centimètres de longueur. Le mufle est régulier.

Dimensions.

	mètre.
Longueur de l'occiput à l'extrémité du museau	0·26
Du bord de l'œil à l'extrémité du museau	0·14
Longueur de l'oreille.....	0·95
„ des cornes.....	0·10
„ de la touffe frontale	0·07

9. Heleotragus reduncus (Pall.).

Un mâle adulte de Huilla par M. d'Anchieta.

10. Hippotragus niger (Harris).

La tête d'un individu mâle envoyée de l'intérieur de Mossamedes par Welwitsch. Les cornes de cet spécimen ont 130 centimètres de longueur.

11. Strepsiceros kudu, Gray.

Deux individus adultes, mâle et femelle, envoyés vivants d'Angola et ayant vécu longtemps dans la ménagerie du Jardin de Necessidades.

Un jeune, de quelques jours à peine, né des précedents, tué par le mâle, qui était d'une grande férocité.

Une jeune femelle de Capangombe, par M. d'Anchieta.

12. Oreas canna, Gray.

Un mâle jeune d'Angola.

19. On the Structure and Development of the Trachea in the Indian Painted Snipe (*Rhynchæa capensis*). By J. Wood-Mason.

[Received June 18, 1878.]

(Plate XLVII.)

During the cold season of 1876–77, Lieut.-Colonel Godwin-Austen and I paid almost daily visits to the Calcutta bazaar for the purpose of making collections of the skins and skeletons of the numerous migratory and other birds which are at that season of the year caught and carried to market in such enormous numbers. On one of these visits my attention was attracted to a bird that lay conspicuous amongst its fellows of the same species by its greater size and more richly coloured plumage, by the low and regular, hoarse

but rich, purring call which, with breast puffed out, it was uttering—a call perceptible to the hand no less than to the ear. I at once recognized the smaller and less conspicuously coloured birds as specimens of one sex; and there seemed very little doubt, from its perfect correspondence in structure and general similarity in plumage, that the larger and handsomer one was an individual of the other sex of the Indian Painted Snipe (*Rhynchæa capensis*, sive *bengalensis*); but which of the two was the female and which the male, it must be confessed, I was at the time ignorant. In order that I might be enabled to determine the precise relation of the two forms to one another, and to ascertain whether any structural differences in their vocal organs accompanied the observed differences in their vocal powers—merely that I might know these facts of my own knowledge, certainly without the slightest hope or thought that I should be able, from such a cursory examination as alone I could give to it, to glean any thing new about so common an animal, I purchased a pair of the species.

Before killing the birds for examination, I referred to Darwin's 'Descent of Man'[1]; and what I read therein served but to increase my interest in the matter; for I soon saw that I had it in my power to corroborate or to contradict a statement which had been made about the trachea of this very species—the very part, curiously enough, the sounds issuing from which had drawn my attention to the bird.

It is well known that in many birds the windpipe, instead of taking a straight course from the *rima glottidis* through the interclavicular membrane to the point where it bifurcates to form the bronchi, is bent upon itself or convoluted, and that often to an extraordinary extent. The position of such flexures is very variable: "they may lie outside the thorax under the integument (as in *Tetrao urogallus*, some species of *Crax* and *Penelope*, and, I may add, the Manucodias[2] and the Rhynchæas), in the cavity of the thorax (as in some Spoonbills), on the exterior of the sternum (as in some Swans and Cranes), or even in a sort of cup formed by the median process of the furcula (as in a species of Guinea-fowl)"[3]. The increase in the length of the tracheal column implied by these convolutions, and other modifications of the windpipe, such as the swollen tympanum of Ducks and Geese, the air-sac of the Emu, may be dependent wholly upon sex; and the males may have the trachea more or less looped or more complex, whilst the females have it straight or simple, or only partially so, in which case the flexure or other modification may be more marked in males than in females. But however this may be, it is a general rule that whenever "the trachea differs in structure in the two sexes it is more developed and complex in the male than in the female"[4]; and it is a fact familiar to all that in the vast majority of instances it is the male which, in point of richness of plumage, vocal powers, and ornamental appendages, is the more highly

[1] *Op. cit.* p. 476.
[2] 'Nature,' vol. xv. p. 127.
[3] Huxley, 'Anatomy of Vertebrated Animals,' p. 315.
[4] 'Descent of Man,' *l. supra cit.*

endowed of the two sexes; but to this there are a few interesting and remarkable exceptions (*Phalaropus*, *Casuarius*, *Dromœus*, *Milvago*, *Climacteris*, *Eurostopodus*, and the Rhynchæas), of which the last, the ones we are here concerned with, are not the least conspicuous. In these birds in general, and in the Painted Snipes in particular, it may be taken as established that we have, to use the words of Mr. Darwin, a complete reversal not only of the secondary sexual characters, but also of the parental and incubating instincts—the females being not only larger and much more richly coloured than the males[1], but having the trachea more or less tortuous instead of straight and simple, deputing the duty of incubation to the other sex, and reserving the business of courting to themselves.

In *Rhynchæa australis*, according to Gould[2], the trachea, which is simple in the males, in the females passes down between the skin and the muscles of the breast for the whole length of the body, making four distinct convolutions before entering the lungs; but Mr. Darwin states, on the authority of Blyth, who had examined many specimens, that "it is not convoluted in either sex in *Rh. bengalensis*, which species resembles *R. australis* so closely that it can hardly be distinguished except by its shorter toes." This is the statement which seemed to me to stand in need of corroboration, especially when I called to mind the peculiar call of the female[3] and the sharp squeak jerked out only at long and irregular intervals by the male, and then apparently only in answer to the female.

On opening the necks of the two birds by a longitudinal incision extending to the middle of the breast or thereabouts, and carefully turning aside the skin on either hand so as not to disturb the natural relations of the underlying parts, I found that the trachea of the adult male (ascertained to be such by subsequent examination of the genital organs) was straight and simple throughout, whilst that of the female had a distinct loop lying between the integument and the interclavicular membrane on the left side, and was not only an absolutely but apparently also a relatively stouter tube than that of the male.

As the contrary of what I have found has been stated by so good and usually trustworthy an observer as Mr. Blyth, I put in evidence two sketches (figs. 1 and 2, p. 748) showing the course of the trachea in the two sexes. For these sketches I am indebted to Col. Godwin-Austen, who was with me at the time.

The numerous birds belonging to this species examined by me may be divided according to sex and age into the following groups:—

1. *Adult and probably old females*, remarkable for the extreme richness of their plumage. In all the birds of this group which

[1] Jerdon, 'Birds of India,' vol. iii. p. 677.

[2] 'Handbook to the Birds of Australia,' vol. ii. p. 275.

[3] Of *R. australis* J. Gould says (*op. cit.* p. 276), "The use of this convoluted trachea, so exclusively confined to the female, I could not in any way discover or surmise; no note whatever was heard to proceed from either sex while on the wing or when flushed"—times at which a call such as that of the female of *R. capensis*, like the coo of a dove, would be least likely to be heard.

were purchased alive and killed and examined before muscular contraction had set in, the trachea was found to be looped as in fig. 1; a specimen living when obtained, but which died unexpectedly and in which decomposition had set in before I had had an opportuuity of

Fig. 1.



Rhynchæa capensis ♀, dissected, so as to show its looped trachea *in situ*.

Fig. 2.



Rhynchæa capensis ♂, dissected, so as to show its straight and simple trachea *in situ*.

opening it, also had its windpipe looped; several, however, that were purchased dead had it retracted, almost straight, with the sterno-tracheal muscles strongly contracted.

2. *Females* not nearly so richly and deeply coloured as the preceding. In these there was only a slight superficial sinuosity in

the trachea, and the remarkable modification of the intrathoracic rings, to be presently described, had not proceeded so far.

3. *Immature females*, indistinguishable in point of plumage, though already larger than males. In all of these, without exception, the windpipe was found quite straight and simple throughout, though even at this stage females are infallibly to be distinguished from males by their stouter trachea, by the more powerful musculature of this, and by the more inflated condition of the delicate membranes connecting the bronchial half-rings with one another and with the three-way piece.

4. *Young, adult, and apparently old males*, all agreeing together in plumage and in the straight and simple condition of the trachea.

We shall see that the superficial loop which is invariably to be found in birds belonging to group 1 (*old females*) is the outward expression, so to speak, of a modification of the intrathoracic tracheal rings that takes place *pari passu* with those external changes which, when they are completed, mark the adult. But in order to make my description of this curious modification more intelligible, a few words, by way of preface, about the unmodified trachea of the male, or, better, of an immature female. If such a trachea be drawn through the fingers from end to end, a broad and shallow constriction will be felt near its posterior end, twenty rings or so from the compound three-way piece; the rings composing it are cylindrical instead of flattened, more than thrice as numerous as they are in an equal length of any other part of the tube, and so closely packed and firmly bound together as to possess little or none of that power of expansion and contraction which, by reason of their peculiarly bevelled ends, so eminently distinguishes the rest; it occupies a position as much within as without the thorax; and the great extrinsic muscles which pass between the sternum and the trachea, serving amongst other purposes as "guys" to keep the latter in place, expand and unite sheath-like over it, being inserted into it at numerous points, but especially at its anterior extremity; it is, in fact, the part of the trachea upon which the sterno-tracheal muscles directly pull when they contract, and thereby approximate the rings of the extensible intrathoracic portion of the windpipe in the adult female, to which we may now return.

On more closely examining the extrathoracic portion of the trachea in a bird in which that part is in the condition represented in fig. 1, p. 748, it can be seen that the loop is almost wholly composed of the constricted portion above described, and that the 2 or 3 rings that immediately succeed in order from before backwards (those situated at the point where the tube disappears within the cavity of the chest) suddenly get coarser and more prominent, and at the same time separated from one another by perceptible membranous intervals. On cutting away the sternum so as not to sever the sterno-tracheal muscles from their attachments, and so as to leave the furcula together with the membrane included between its two arms in place, the rest of the tube is displayed in a completely extended condition; it is then seen that the 12 or 13 rings immediately succeeding the coarser

ones which follow upon the fine-ringed constricted portion become suddenly still coarser and more prominent and convex, have lost their typical bevelled form, and are separated from one another by far longer and subequal membranous intervals. These are thin and transparent, and each is so constricted in the middle that any two consecutive rings form, with the membrane that connects them, a short hourglass-shaped figure. Six or seven coarsish rings, separated by much narrower membranous intervals, but otherwise unmodified, complete this portion of the tube, which is twisted spirally to the left, carrying spirally entwined with it the elongated sterno-tracheal muscles. The rings have come to be bent, and, instead of appearing as regular parallel bands as in other parts of the column, to be arranged obliquely, by adaptation, no doubt, to the spiral form taken by the tube whenever it is extended, so as, in fact, to present somewhat the appearance of having resulted from the breaking up into rings of what was primitively a hard spiral thickening of the walls of a membranous tube. Inside the thorax the spiral is necessarily very open, from the tube being restricted to a middle position by the membranous bands which sling it, together with the anterior moieties of its great contractor muscles, from the dorsal wall of the body, so as to form a sheath for it; whilst outside, in the neck, where is more room and more lateral freedom, it becomes closer, there constituting the well-marked superficial loop, the concave curvature of which is the true ventral surface of that fine-ringed portion of the tube over which the muscles spread, twisted out of its natural position.

If an adult female be killed with chloroform and rapidly opened, the sterno-tracheal muscles may be seen slowly to contract, and thereby gradually to take out the superficial spiral "turn" from the trachea, and the intrathoracic rings of this to close up, until at last all that remains of the loop is a slight sinuosity visible near the point where the tube passes into the thorax, the constricted and close-ringed portion, which occupied that position in the unmodified trachea, also having acquired an ineffaceable crook.

Unfortunately, we possess no more complete description of the highly convoluted trachea of the Australian species than that quoted above; but the two species *R. capensis* and *R. australis* are so very closely allied that we may feel tolerably confident that the tracheal modification is of the same kind in the two, only carried to a much greater extent in the latter, the constricted many-ringed part of the trachea of the former containing two or three potential convolutions.

In conclusion, I have to thank Col. Godwin-Austen for aid rendered to me in the matter of the illustrations.

EXPLANATION OF PLATE XLVII.

Fig. 1. The complete trachea of an adult female of *Rhynchæa capensis*, nat. size, showing the modified intrathoracic portion of the tube in an expanded condition. The compound three-way piece is seen to be formed by the partial fusion of the last tracheal ring with the modified first pairs of bronchial half-rings; these have their ventral ends

greatly expanded and produced backwards, so as to form by their fusion in the middle line a broad, flat, and squarish plate of bone strongly bilobed and tipped with cartilage at the hinder extremity, into which ossification extends with advancing age, rendering the posterior angles of the plate prominent, and bringing them into very loose relation of apposition with the much less expanded ventral ends of the second pair of bronchial half-rings; the ovoid saccular dilatations seen in figs. 3 and 4 result partly from the inflation of the membrane interposed between the ends of these half-rings and the posterior angles of the three-way piece, but principally from that of the ventral halves of the membranous inner walls of the second and third pairs of bronchial half-rings. The spatulate dorsal ends of the first pair of bronchial half-rings do not meet in the middle line, but curve inwards and backwards so as to leave between them a membranous interval, into which a narrow tongue of bone projects from the middle of the posterior margin of the last tracheal ring. In so small a figure no distinction between bone and cartilage in the three-way piece was possible. Drawn from a fresh specimen by Behari Lál Dós.

Fig. 2. A much enlarged view of a portion of the same, to show the form the modified part of the tube assumes when it is naturally expanded; the constricted portion (*a*) presents a singularly finely and regularly ribbed appearance, being composed of about forty very fine and closely packed cylindrical rings, all firmly bound together so as to form a stiff but still somewhat elastic mass.

Fig. 3. A much magnified ventral view of the posterior end of the same, to show the inflated condition of the membrane connecting the compound three-way piece with the second (apparent first) bronchial half-ring on each side, and also the two egg-shaped saccular dilatations (*e*, *e*) of the membranous inner walls of the bronchi.

Fig. 4. The same, from the left side, to show the egg-shaped dilatations (*e*, *e*) in profile, and the thin and narrow lateral slip of muscle (*l*) which is attached to the three-way piece at *m*, whence some of its fibres pass on to the second bronchial half-ring (*n*).

(All the three preceding figures were drawn under the microscope by the aid of a camera lucida, immediately after the death of the animal.)

Fig. 5. The complete trachea of an immature female, nat. size. The two sterno-tracheal muscles (*st.t*, *st.t*) are seen to be blended on the ventral surface of the constricted portion of the tube at *a*; *l*, *l*, are the lateral muscles, somewhat exaggerated in the drawing. Drawn by B. L. D.

Fig. 6. The posterior portion of the unmodified windpipe of an adult male, nat. size. The lateral muscles (*l*, *l*) are here so pale and transparent as to be all but undistinguishable in the fresh state.

Fig. 7. The same, much enlarged.

(With the two exceptions above mentioned, the figures of this plate have been obligingly drawn for me by Lieut.-Col. H. H. Godwin-Austen, by whom also the plate has been lithographed.

The following paper was read on June 4th, but was necessarily omitted from its proper place in consequence of the illustrations not having been finished in time:—

On the Classification and the Distribution of the Crayfishes. By T. H. Huxley, Sec. R.S., V.P.Z.S.

[Received May 23, 1878.]

I. Introduction, p. 752.
II. The Modifications of the Branchiæ in the Crayfishes, p. 756.
1. The branchiæ of *Astacus*, p. 756.
2. The branchiæ of *Cambarus*, p 763.
3. The branchiæ of *Astacopsis*, p. 764.
4. The branchiæ of *Chœraps*, p. 768.
5. The branchiæ of *Engæus*, p. 769.
6. The branchiæ of *Paranephrops*, p. 770.
7. The branchiæ of *Parastacus*, p. 771.
8. The branchiæ of *Astacoides*, p. 773.
III. The Classification of the Crayfishes, p. 775.
IV. The Distribution of the Crayfishes considered in relation to their morphological differences, p. 786.

I. Introduction.

The dismemberment of the genus *Astacus* of the older naturalists, down to the time of Fabricius, was commenced by Leach, who separated the Norway Lobster as the type of a new genus, *Nephrops*[1].

Milne-Edwards advanced a step further by establishing the genus *Homarus* for the Lobsters, and leaving only the freshwater *Astaci*, or the proper Crayfishes, in *Astacus*[2].

The later proposal of Leach, to use *Astacus* for the Lobsters, and to give a new generic name (*Potamobius*) to the freshwater Crayfishes, would have had the advantage of retaining the primitive signification of *ἀστακός*. But *Potamobius* had already been used in another sense; and the change introduced by Milne-Edwards is so generally adopted that it would be confusing to attempt any further alteration.

Guérin[3] next proposed to distinguish the *Astacus madagascariensis* of Audouin and Milne-Edwards, as *Astacoides*, from the other Crayfishes; and Erichson, in his valuable Monograph of the group[4], adopts *Astacoides* for the Madagascar and some of the Australian forms, and establishes the new genera *Cambarus*, *Chœraps*, and *Engæus*. In *Cambarus* and *Chœraps* the number of the branchiæ is taken into account as an important generic character.

In 1842[5] Mr. Adam White described some Crayfish from New Zealand, for which he constituted a new genus, *Paranephrops*, under the impression that the New-Zealand form approximated to the genus *Nephrops*. Mr. Wood-Mason[6] has since "denied the existence of any special relationship between the New-Zealand

[1] Leach, Trans. Linn. Soc. xi. 344.
[2] 'Histoire Naturelle des Crustacés,' 1837.
[3] Revue Zoologique, 1839.
[4] "Uebersicht d. Gattung Astacus," Archiv für Naturgeschichte, Bd. 6.
[5] Gray's 'Zoological Miscellany.' See also Dieffenbach's 'New Zealand,' 1843, vol. ii. p. 267.
[6] Proc. Asiat. Soc. Bengal, 1876, p. 4.

species of freshwater *Astacidæ* and the marine genus *Nephrops*;" and "as the species referred to *Paranephrops* differed less from [some of] those of *Astacoides* than these latter did from one another, and as, moreover, the latter name had the priority, he proposed provisionally to refer the New-Zealand species of *Astacidæ* to it."

Mr. Wood-Mason is unquestionably right both in denying any special relationship between *Paranephrops* and *Nephrops*, and in asserting that the New-Zealand Crayfish differ less from some of the species of the genus *Astacoides*, as its limits are at present understood, than these do from one another. But I shall have occasion to show that the type of the genus *Astacoides*, the Madagascar Crayfish, differs so widely from the other Crayfishes of the southern hemisphere, that the latter cannot be included in the same genus; while *Paranephrops* is sufficiently different from the Australian and Tasmanian Crayfishes to render its recognition as a distinct generic type desirable [1].

The distribution of the Crayfishes, so far as it is hitherto ascertained, is not a little remarkable. *Astacus fluviatilis* occurs in various parts of England and in Ireland; but I cannot find any record of it in Scotland. Dr. M'Intosh, who has been kind enough to look into this point in aid of my inquiries, assures me that Crayfishes are not indigenous to that part of Britain, that they do not exist in the Tweed and the Teviot, and that an attempt to introduce them into the island of Mull failed; they were placed in various streams, but none were ever seen again. Even in England, Crayfishes appear to be restricted to certain rivers. They abound, for example, in the Thames; but I cannot hear of any in the Cam or the Ouse, though their absence in the latter rivers cannot be ascribed to any want of calcareous matter in the districts through which those rivers flow.

Astacus fluviatilis, however, extends all over the western half of Europe, as far south as the Pyrenees and the northern shores of the Mediterranean; while, eastward, it reaches Sicily, Northern Greece, and the western shores of the Black Sea. In Spain there appears to be no doubt that it occurs about Barcelona; but whether it is found in the rest of the Spanish peninsula is uncertain [2].

Northwards and eastwards, *Astacus fluviatilis* extends to Sweden and the Baltic provinces of Russia, and through Western Russia, by the basins of the Dniester and the Bug, to the Black Sea.

Over this vast area, marked local varieties appear to be not uncommon; and most authors agree to regard a Crayfish which occurs in Southern Europe, France, Switzerland, and Germany, and which

[1] See on this subject the remarks of Mr. Miers, "Note on the genera *Astacoides* and *Paranephrops*" (Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. 1876).

[2] See Gerstfeldt, "Ueber die Flusskrebse Europa's" (Mém. presentés à l'Acad. Imp. des Sciences de St. Petersbourg, 1859, p. 587). As far back as 1675, Sachs à Lewenheimb wrote:—"Sic in Hispaniâ licet flumina, negant inveniri ibi *Cancros fluviatiles*, contrà in Galliâ frequentissimi, item in Pannoniâ, in Helvetiâ, in Germaniâ; etiam in fluviis Americanis inveniri referunt navigatores. In fluvio Lydiæ Haly cancros invenit Busbequius, Ep. Turc. i. p. 89." But were these Lydian "cancri" crayfishes or fluviatile crabs?

is known in the latter country as the "Steinkrebs," as a distinct species, *Astacus torrentium* or *A. saxatilis*[1].

Eastward of the region inhabited by *Astacus fluviatilis*, from the Arctic to the Black and Caspian Seas, another species, *A. leptodactylus*, ranges, associated with the allied but possibly distinct forms *A. pachypus* and *A. angulosus*, in the southern part of the area; and it is remarkable that these Crayfishes not only frequent the rivers which debouch into the Black Sea and the Caspian, but are said to thrive in the salt waters of those seas.

No Crayfishes are known in the Ob, Jenisei, Lena, or other rivers which flow into the Arctic Ocean[2]; but the Amur has one or two species (*A. dauricus*). There is a species in Japan (*A. japonicus*); and Dr. Hagen[3] enumerates no fewer than six species from British Columbia, Oregon, and California.

East of the Sierra Nevada, all the Crayfishes at present known belong to the genus *Cambarus*, of which Dr. Hagen distinguishes as many as thirty-two species. They extend from the Great Lakes to Mexico, Guatemala, Cuba, and probably other of the West-India Islands. Sloane, in his 'Natural History of Jamaica' (vol. ii. p. 271) describes two species in that island. According to the figure, one of these attains a length of 12 inches.

No Crayfishes are known to occur in the whole continent of Africa, in Syria, the Euphrates valley, Persia, Hindostan, and India beyond the Ganges, nor in China as far as the Corea, nor in the Philippines, nor in any island of the Malay or Papuan archipelagos[4]. The late Prof. Agassiz, though he sought for Crayfishes in the

[1] In 1560, Gesner was acquainted with this distinction:—"Astacus fluviatilis talis apud Helvetios et Germanos est, major silicet et simpliciter dictus *Krebs* vel *Edelkrebs*; eo enim minor est, et colore diversus qui saxatilis cognominatur *Steinkrebs*." ('Nomenclator Aquatilium,' p. 374). Heller (Die Crustaceen des südlichen Europa, p. 217) refers our English Crayfish to this species; but no specimens I have seen agree with his diagnosis. Whether there is any difference between *A. saxatilis* and the Crayfishes which have been named *A. pallipes* and *A. fontinalis* by Lereboullet and Carbonnier; and whether our English Crayfish is more similar to these than to the form which is commonly known as *A. fluviatilis* on the Continent, is more than I am able to say at present. A critical comparison of large series of specimens from different localities would probably yield results of great interest to the theory of the origin of species.

[2] Kessler, "Die russischen Flusskrebse" (Bull. de la Soc. Imp. des Nat. de Moscou, 1874).

[3] 'Monograph of the North-American Astacidæ,' Illustrated Catalogue of the Museum of Comparative Zoology at Harvard College, 1870.

[4] I have been favoured by Sir Henry Barkly with the opportunity of examining specimens of two kinds of "Cammarons," or so-called Crayfishes, from the rivers of Mauritius. They are large Prawns.

I must confess myself to be in a state of hopeless perplexity respecting the Crayfish or Lobster which is said to occur at the Cape of Good Hope, *Cancer* (*Astacus*) *capensis* of Herbst. At the beginning of his description (Naturgeschichte der Krabben und Krebse,' Band ii. p. 49) Herbst says:—"Dieser schöne Krebs hält sich auf den Kap in solchen Flüssen auf, die sich auf den Bergen befinden;" and at the end he states, "die Füsse haben insgesammt scheerenförmige Spitzen, da bey dem gemeinen Flusskrebs nur die ersten zwey Paare dergleichen haben." Moreover, the diagnosis runs, "pedibus omnibus cheliferis." It is impossible to suppose that Herbst should have made a mistake on such a point as this; and therefore it must be concluded that his *Cancer ca-*

Amazons, could find none. Two species from Southern Brazil have been described by Dr. von Martens[1] as *Astacus brasiliensis* and *A. pilimanus*; but Von Martens recognizes the affinity of these forms with the *Astacoides* of Erichson.

Several species of *Paranephrops* have been described from New Zealand; and the Fijian Crayfish belongs to the same genus.

Crayfishes occur all over Australia; and the species have been referred to the genera *Astacoides* and *Chæraps*. The only Tasmanian species which have been described constitute the genus *Engæus* of Erichson.

Thus it appears, from what is already published on this subject:—

1. That the Crayfishes of the northern hemisphere are generically distinct from those of the southern hemisphere.

2. That the American Crayfishes, east of the Sierra Nevada, are generically distinct from those west of that range, as well as from the South-American species; and that, while the western North-American Crayfishes belong to the same genus as those of the Old World, the South-American forms are more closely allied with those of Madagascar and Australia.

3. That the New-Zealand species are distinct from the Australian forms; and that the latter are to be placed in the same genus as the Madagascar and South-American species.

4. That there is a negative fact of distribution, not to be accounted for by any apparent difference of climate or other physical conditions—namely, the entire absence of Crayfishes in Equatorial South America, Africa, and the rest of the Old World south of the northern escarpment of the great Asiatic highlands.

The problem thus offered is one of the most remarkable among the many presented by the facts of Geographical Distribution; and it appeared to me that one of the first steps towards attempting its solution was to obtain some more definite conception, than is furnished by extant descriptions, of the actual amount of resemblance and difference between the Crayfishes which are found in the different areas of distribution.

For the most part the Crayfishes are so similar in their general structure, that the characters by which the genera have been distinguished are almost trivial. Erichson, however, has drawn attention

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pensis is neither a Crayfish nor a Lobster, and that, unless he was wrongly informed, it is an inhabitant of fresh water.

Milne-Edwards (Hist. Nat. des Crustacés, ii. p. 335) identifies his *Homarus capensis* with the *Cancer capensis* of Herbst; but, as it is stated in the definition of the genus *Homarus* (*l. c.* p. 333) that the Lobsters "ne se trouvent que dans la mer," and as *Homarus* has only three pairs of chelate limbs, the identification presents difficulties. Krauss (Südafrikanische Crustaceen, p. 54), under the head of "*Homarus capensis*," refers to Herbst and Milne-Edwards, and, apparently on the authority of the former, merely says:—"In den Bergflüssen des Kaplandes. Ich habe ihn in Natal nie gesehen." Elsewhere (p. 20) he gives "*Thelphusa perlata* and *T. depressa* and *Homarus capensis*" as the only South-African freshwater Thoracostraca.

[1] "Südbrasilische Süss- und Brackwasser-Crustaceen," Archiv für Naturgeschichte, 1869.

to the diminution of the number of the branchiæ in *Cambarus* and *Astacus*, and to an important difference in the structure of those of *Engæus*; and Hagen has pointed out some important peculiarities of these organs in *Cambarus*; while the remarkable fact, that the appendages of the first somite of the abdomen are absent in many of the Crayfishes of the southern hemisphere, has been duly noted by Erichson and several other zoologists.

Having recently had occasion to make a careful reexamination of the structure of *Astacus fluviatilis*, I found two minute filaments attached to the epimera of the penultimate and antepenultimate thoracic somites. The structure and the position of those filaments led me to suspect that they must be rudimentary branchiæ [1]; and as the Australian Crayfishes appeared to me to be, on the whole, less specialized forms than the European species, I thought that I should probably find in them fully-formed functional branchiæ occupying the place of these rudiments. Through the kindness of my friend and former pupil, Mr. J. Wood-Mason, a specimen of "*Astacoides*" *franklini* was placed at my disposal; and on examination, I not only found the functional branchiæ I sought, but discovered a number of other interesting differences between the respiratory organs of this Crayfish and those of *Astacus*.

Following up the line of inquiry thus suggested, I have examined examples of all the chief forms of Crayfishes at present known, with the result of establishing some remarkable parallel relations between the morphology and the distribution of these animals.

In order to make these points clear, I must premise a fuller and more precise description of the branchial apparatus of the common Crayfish than has yet been given, in order that it may serve as a standard of comparison for the branchiæ of the other Crayfishes.

II. The Modifications of the Branchiæ in the Crayfishes.

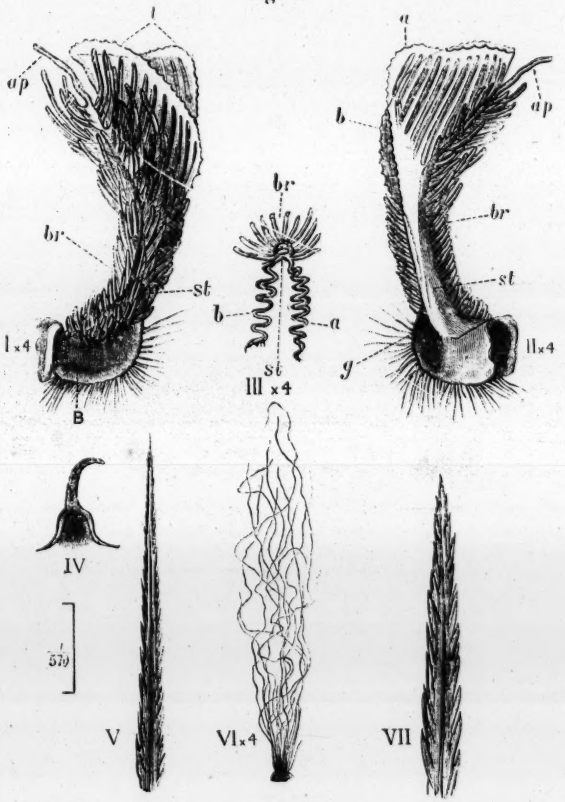
The Branchiæ of Astacus fluviatilis.

When the branchiostegite of a Crayfish is removed, seven branchiæ are seen, running from the base towards the apex of the branchial cavity, parallel with one another, and disposed in curved lines, which are concave forwards and convex backwards. The length of the branchiæ gradually increases from the first to the sixth; the seventh ascends as high as the sixth, but is rather shorter, in consequence of the attachment of its base lying at a higher level.

In each of the six anterior branchiæ, a *basal portion*, a *stem*, an expanded *lamina*, and an *apical plume* may be distinguished. The *basal portion* (fig. 1, I, B) is broad, with a convex posterior and inferior free edge, beset with long setæ; and it is articulated by its

[1] I have met with no allusion to these structures, unless the following passage in Brandt's and Ratzeburg's description of the Crayfish (Med.-Zoologie, ii. p. 61) refers to them:—"Ueber jeder der obersten Kiemen der beiden mittlern Fusspaare steht etwa 1‴ entfernt ein kleiner fädenförmiger, unten breiterer, bärtelähnlicher Theil." I do not quite see the applicability of "unten breiterer," unless "unten" applies to the attached ends of the filaments; but in other respects the description fits the rudimentary branchiæ very well.

Fig. 1.



Astacus fluviatilis.

I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side (× 4): B, the basal portion; *st*, the stem; *l*, the lamina; *br*, the branchial filaments; *a p*, the apical plume. II. The inner face of the same podobranchia (× 4): the letters as before, except *g*, the decurrent fringe, continued from the inner lobe of the lamina. III. A transverse section of the podobranchia, taken a little above the level of *b* in II. (× 4): *a*, the inner lobe of the lamina; *b*, its outer lobe; *st*, the stem; *br*, the branchial filaments. IV. One of the hooks of the lamina; and V The extremity of one of the setæ of the base of the podobranchia: the vertical line indicates the scale to which these figures are drawn, and represents $\frac{1}{379}$ of an inch. VI. The coxopoditic setæ of the same limb (× 4). VII. The free end of one of these setæ, magnified to the same degree as IV. and V.

truncated anterior end with the coxopodite of one or other of the thoracic limbs, from the second maxillipede to the penultimate ambulatory limb inclusively. I shall therefore term these gills *podobranchiæ*. A fold of the integument rises over the outer face of the basal portion of the branchia, which is freely movable, inwards and outwards, upon its articulation.

The basal portion of the branchia curves slightly upwards, and is continued into the comparatively narrow *stem* (fig. 1, *st*), which bends up at right angles to the base, and lies nearly parallel with the inner wall of the branchial chamber. Rather beyond the middle of its length, the stem expands into the broad *lamina* (fig. 1, *l*), the two lobes of which are folded together like the leaves of a partly open book, their free rounded edges being turned backwards and the uniting fold forwards. The lamina of each branchia, from the second to the sixth, is received between the lobes of the lamina of that which precedes it, and, from the first to the fifth, receives the lamina of the branchia which follows it.

The edges of the laminæ are beset with minute hooked spines, seated upon low tubercles (fig. 1, IV.), and are flat; but, a short distance within the edge, each lamina is folded longitudinally in such a manner as to give rise to ten or twelve plaits. From the mode of their formation, these plaits or folds are, of course, as distinctly marked on the outer as on the inner faces of the laminæ (fig. 1, III.). Small elevations, terminated by minute hooked setæ, like those on the edges of the laminæ, are observable on both faces, particularly on the ridges.

The inner lobe of the lamina is continued down the stem as a decurrent gradually narrowing fringe, which terminates on the inner face of the basal portion (fig. 1, II. *g*). The outer lobe ends more abruptly, in a thin ridge which lies external and posterior to the last. Between this ridge and the fringe there is a longitudinal groove, which occupies the inner and posterior face of the stem.

A short distance from the upper edge of the lamina, and proceeding, as it were, from the anterior face of the median fold of the latter, the *apical plume* (fig. 1, I. *a p*) is given off. At its base this is beset with cylindrical branchial filaments; but at its free extremity it becomes simple and filiform; at its attached extremity, it passes into the stem of the gill, of which it is seen to be the direct continuation. The whole of the outer and anterior face of the stem, as far as the basal fold, is beset with branchial filaments, of which those in the region of the lamina are the longest, while towards the base they are shorter and more closely set.

Close to the attachment of the podobranchia, the upper surface of the coxopodite presents a rounded elevation, from which a great number of long, flexible and tortuous setæ proceed (fig. 1, VI.). When undisturbed, they ascend vertically between the gills on the sides of the branchial chamber. The apex of each of these *coxopoditic setæ* is acute; and at a short distance from its extremity it is beset with numerous short foliaceous scales, which gives it the aspect of a minute catkin (fig. 1, VII.). Further down these scales become

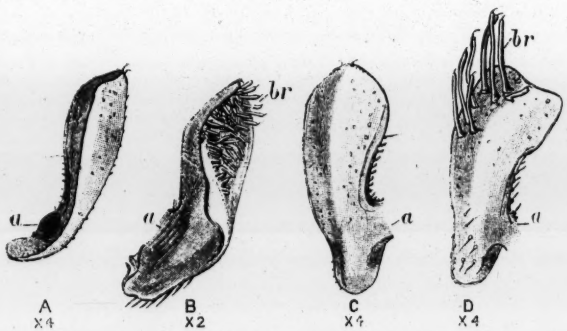
more widely separated, and at length disappear, the base of the seta being smooth. A canal traverses the whole length of the seta.

These bundles of setæ were regarded as branchiæ by Brandt and Ratzeburg; but they certainly have no direct relation to the respiratory function. They may aid in keeping parasites out of the branchial chamber.

The setæ which fringe the base of the podobranchia are straight, stiff, hollow, and composed of a cylindrical basal portion, and an acuminated acicular terminal part, which often appears articulated with the foregoing; the junction of the two is marked by an inflexion of the wall of the seta. The acicular part (fig. 1, v.) is fringed with minute pointed scales, which, in the setæ of the anterior part of the base, pass into long lateral processes, and give the seta a penniform appearance. None of these setæ are hooked at the apex.

The only differences, except those of size, which are observable in the six podobranchiæ, are, that the external lobe of the lamina, which is not nearly so large as the internal, in the hindermost

Fig. 2.

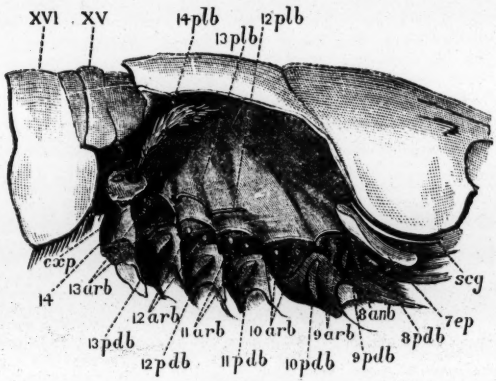


A. The podobranchia (epipodite) of the first maxillipede of *Astacus fluviatilis*, viewed from the outer side (× 4). B. The podobranchia of the first maxillipede of *Astacoides madagascariensis*, outer side (× 2): *br*, branchial filaments. C. The podobranchia (epipodite) of the first maxillipede of *Astacus fluviatilis*, viewed from behind (× 4). D. The podobranchia of the first maxillipede of *Parastacus brasiliensis*, from behind (× 4); *br*, branchial filaments. In each figure *a* marks the pedicle by which the more or less modified podobranchia is attached to the coxopodite.

branchia increases in relative size, until, in the most anterior branchia it becomes larger than the internal lobe. The penniform setæ are more numerous on the bases of the anterior podobranchiæ.

The first maxillipede is said, and, in a physiological sense, rightly, to possess no branchia; but it is provided with an appendage (fig. 2, A, c) which is undoubtedly the homologue of the podobranchia of the other thoracic limbs. This is a soft membranous

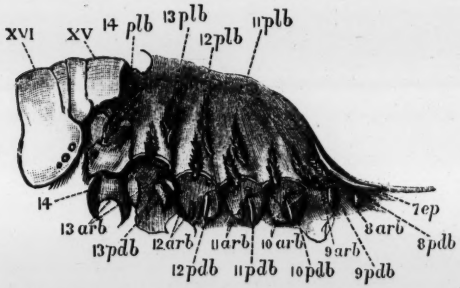
Fig. 3.



Astacus fluviatilis.

The branchiostegite, all the podobranchiæ, except the epipodite of the first maxillipede, and all the arthrobranchiæ of the right side are removed (× 4).

Fig. 4.



Astacopsis franklinii.

The branchiostegite, all the podobranchiæ, except that of the first maxillipede, and all the anterior arthrobranchiæ, except the first, of the right side are removed (× 2).

scg, scaphognathite (not shown in fig. 4); 7 *ep*, the podobranchia of the first maxillipede; 8 *pdb* to 13 *pdb*, the other podobranchiæ; 8 *arb* to 13 *arb*, the arthrobranchiæ or their attachments to the arthrodial membranes of the second and following thoracic appendages; 11 *plb* to 14 *plb*, the pleurobranchiæ; 14, the coxopodite of the hindermost ambulatory limb; *exp*, the coxopoditic setæ of that limb in *Astacus*.

plate, which broadens at its upper extremity, and sends a short process downwards beyond its articulation with the coxopodite of the maxillipede. The plate is slightly folded upon itself longitudinally, but in such a manner that it is concave forwards instead of backwards. It bears no branchial papillæ, and has no longitudinal plaits; but, on its posterior face and along its inner edge, it presents hooked tubercles, like those of the laminæ of the podobranchiæ. It is obvious that this structure, which lies immediately behind and parallel with the scaphognathite of the second maxilla (but, as I have ascertained, does not share its function of scooping the water out of the branchial cavity[1]), is a modified podobranchia, reduced, as it were, to the part which, in the other podobranchiæ, is represented by the base, stem, and lamina.

Thus every thoracic limb, except the last, is provided with the representative of a podobranchia—though, in the case of the first maxillipede, this structure, if it plays any part in the respiratory process, does so simply in virtue of its thin and soft texture, and not by means of any special branchial filaments. The podobranchia of the first thoracic appendage is, in fact, reduced to a mere *epipodite*.

When the podobranchiæ are removed, six other gills come into view. They are attached (fig. 3, *arb*) to the flexible membrane which unites the coxopodites of all the thoracic limbs to the thorax, save the first and last, and may be termed *anterior arthrobranchiæ*. Like the foregoing, they are disposed vertically, and increase in size from the first, which belongs to the second maxillipede and is hidden behind the epipodite of the first maxillipede, to the last. The apex of each of these gills is exactly like the apical plume of one of the podobranchiæ; and the branchial filaments are set upon the outer and anterior face of the stem in the same way. The inner face is flat and free from filaments; and there is no trace of a lamina or of a basal dilatation.

Above and behind these, more directly above in the posterior, more behind in the anterior limbs (fig. 3, *arb*), are five other branchiæ of similar character, attached to the arthrodial membranes of the third maxillipede and the anterior four ambulatory limbs. These may be termed the *posterior arthrobranchiæ*.

After the removal of all these functional branchiæ, there will be found, immediately above the bases of the penultimate and antepenultimate thoracic limbs (fig. 3, 12 *plb*, 13 *plb*), two minute filamentous processes, the longer of which was not more than one sixth of an inch in length in any specimen I have examined, while both are so delicate as to be invisible except under a simple lens. The posterior of these is the larger: it has the structure of an ordinary branchial filament, with a somewhat swollen base, which is attached to the margins of a foramen in the lower part of the epimeron of the penultimate thoracic somite, just below a transverse depression which separates this from the upper part of the epimeron. The position

[1] If the branchiostegite of a living Crayfish is carefully removed, the rapid rhythmical motion of the scaphognathite is readily seen; but the modified podobranchia of the first maxillipede remains quiescent.

of this filament is sometimes vertical, but more frequently horizontal. The anterior filament is sometimes a mere papilla; it is attached to the margins of a small foramen which occupies a similar position in the antepenultimate epimeron—namely, close to the anterior edge and just below the transverse depression. These are two rudimentary gills, of the same order as that next to be described.

The seventh, and most posterior branchia of those which become visible when the brachiostegite is removed (fig. 3, 14 *plb*), has yet to be considered. It resembles one of the arthrobranchiæ in all essential characters, but it is not attached to the arthrodial membrane; on the contrary, the base of its stem is fixed to the margins of a circular aperture situated close to the edge of a peculiar shield-shaped plate, the posterior and outer surface of which is covered with strong setæ. Immediately behind and below the attachment of the gill there is an oval space, occupied by a soft and flexible portion of the cuticle, like a tympanic membrane. By its lower margin this plate furnishes an articular surface to the outer condyle of the coxopodite of the last thoracic limb, while its anterior and upper angle, bending sharply upwards, passes into a curved prolongation, which extends upwards and backwards in the soft integument of the flank, and articulates with a slender process of somewhat similar form sent forward from the first abdominal somite. Internally this shield-shaped branchiferous plate is continuous with the sternum of the last thoracic somite. It is obvious that this plate, with its anterior process, represents the epimeron of the last thoracic somite, which is thus adherent to the penultimate somite only by the slender anterior and superior process and the soft integument. Hence, the last thoracic somite moves easily upon its predecessor, though, in strictness, the usual statement that the last thoracic somite in *Astacus* is "free" is not altogether exact.

It follows from this determination of the nature of the shield-shaped plate, that the gill which it bears is attached to the epimeron, or side-wall, of the last thoracic somite; and it may be termed a *pleurobranchia*. The similarly attached filaments (12 *plb* and 13 *plb*) represent reduced or rudimentary pleurobranchiæ.

We may suppose that the total number of branchiæ which a thoracic somite can possess is eight, four on each side, namely:—one podobranchia, connected with the coxopodite of the appendage; two arthrobranchiæ, fixed to the articular membrane; and one pleurobranchia, attached to the epimeron. And if four places for branchiæ are assigned to each somite, the extent to which the hypothetically complete scheme or formula is actually filled up will be readily seen, and the branchial arrangements of different Crayfishes will be easily compared.

The Branchial formula of Astacus fluviatilis[1].

Somites and their appendages.	Podo-branchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleuro-branchiæ.	
VII.....	0 (ep)	0	0	0	= 0 (ep)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	0	= 3
XII.....	1	1	1	*r*	= 3+*r*
XIII.....	1	1	1	*r*	= 3+*r*
XIV.....	0	0	0	1	= 1
	6+ep+	6 +	5 +	1+2*r*	=18+ep+2*r*

"ep" here signifies a podobranchia which has lost its branchial filaments and become completely metamorphosed into an epipodite, while *r* indicates that a rudiment of a branchia exists.

It will be observed that, in this species of Crayfish, no somite possesses its hypothetically full complement of branchiæ except XII. and XIII.; and even in them the pleurobranchiæ are rudimentary. The representatives of eleven possible branchiæ are altogether wanting.

2. *The Branchiæ of* Cambarus.

The principal distinction between this genus and *Astacus*, as it was established by Erichson, lies in the absence of the single pleurobranchia of the latter, and the consequent reduction of the number of the branchiæ to seventeen on each side.

In his elaborate monograph of the genus, Dr. Hagen observes, "But there is also another difference, not before noticed[2]. In *Astacus* each pair of gills, except the single one on the fifth set of legs, has a broad deeply-folded membrane, closely fixed behind the most external gill-lobe. In *Cambarus*, this membrane is always wanting in the gills of the fourth pair of legs, but exists, as in *Astacus*, in all the others.

"In the true *Astacus*, all the gills with a folded membrane behind have a basal external bundle of shorter but broader and irregularly placed gill-tubes; these are never to be found in *Cambarus*."

In a species of *Cambarus* from Guatemala, of which a number of specimens have been presented to the British Museum by Mr. Salvin[3], I find Dr. Hagen's first remark fully borne out. The last

[1] In this, as in all other cases, it is to be understood that the branchial formula gives the branchiæ of only one side of the body, and that the total number of branchiæ is therefore double that given in the formula.

[2] Dr. Hagen appears to have overlooked De Haan's definition of the distinctive characters of the American Crayfishes known to him:—

"Branchiæ 17; nulla supra pedes quintos; *externæ supra quartos tantum e tubulis liberis*, externæ supra sequentes infra e tubulis, supra e laminis tuberculatis compositæ" (Fauna Japonica, Crustacea, p. 164).

[3] Mr. Salvin informs me that they were obtained in a river near Coban, in Vera Paz, at an elevation of about 4300 feet above the sea.

podobranchia is devoid of even a trace of a lamina; in the five which precede it, on the other hand, the lamina is very large, and folded into two longitudinally plaited lobes, as in *Astacus*. The edges and the surfaces of the laminæ present tubercles, which are more prominent than in *Astacus*, and bear similar hooked spines.

The inner decurrent prolongation of the lamina is wider than in *Astacus*, particularly in the anterior podobranchiæ. It is also beset with hooked setæ mounted on low tubercles.

The setæ of the upper part of the base are relatively shorter. As in *Astacus*, their apices are straight and not hooked.

The coxopodites bear bundles of twisted setæ, which are similar to those of *Astacus*, but are more obtusely pointed.

The arthrobranchiæ are similar in number and in form to those of *Astacus*. Those of the posterior series are proportionately larger.

I cannot discover a trace of the hindermost pleurobranchia, nor of the rudiments of the anterior ones, in this species; but it is not improbable that they may be discovered in larger forms.

The modified podobranchia (epipodite) of the first maxillipede is soft, and folded longitudinally in such a manner as to present a broad and shallow anterior groove. It bears no branchial papillæ, nor any setæ; but there are a few short hooks here and there.

The Branchial formula of Cambarus.

Somites and their appendages.	Podo-branchiæ.	Arthrobranchiæ.		Pleuro-branchiæ.	
		Anterior.	Posterior		
VII.....	0 (ep)	0	0	0	= 0 (ep)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	0	= 3
XII.....	1	1	1	0	= 3
XIII.....	1	1	1	0	= 3
XIV.....	0	0	0	0	= 0
	6+ep	+6 +	5 +	0	= 17 + ep.

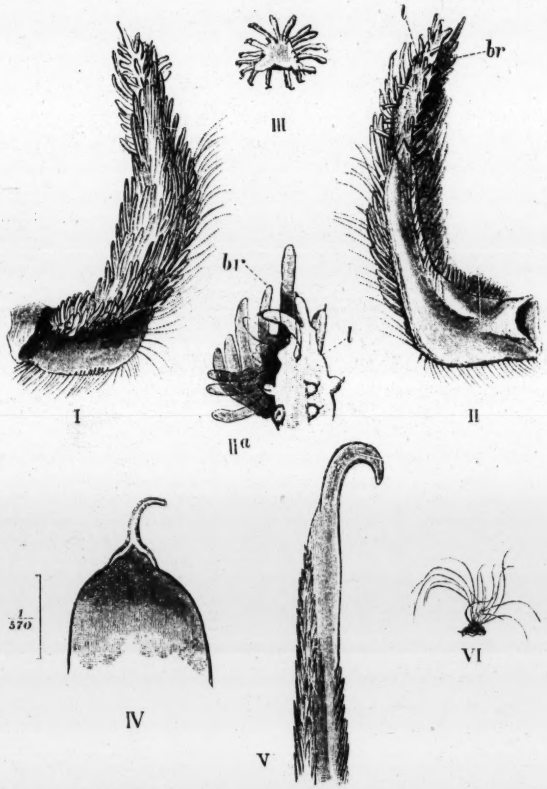
In comparison with *Astacus*, there is obviously a reduction of the branchial system, arising from the complete disappearance of all the pleurobranchiæ in *Cambarus*.

3. *The Branchiæ of* Astacopsis[1] franklinii.

When the branchiostegite is removed, seven branchiæ are seen, having the general appearance and disposition of those of *Astacus*; and, as in *Astacus*, the six anterior are podobranchiæ, attached to the coxopodite of the second maxillipede and the five following appendages, while the seventh is a pleurobranchia, fixed to the epimeron of

[1] Since, as will be shown below, those Australian Crayfishes which neither belong to *Chæraps* nor to *Engæus* are distinct from *Astacoides*, as represented by the Madagascar species, I propose to apply the generic name of *Astacopsis* to them.

Fig. 5.



Astacopsis franklinii.

I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side (×3½). II. The inner face of the same podobranchia: *br*, branchial filaments; *l*, rudimentary lamina. II *a*. The apex of the same, more highly magnified. III. A transverse section of the podobranchia at about the junction of its middle and upper thirds. IV. The extremity of one of the hooked filaments; and V, that of one of the hooked setæ. In these two figures the vertical line represents $\frac{1}{570}$ of an inch magnified to the same extent. VI. The coxopoditic setæ (×3½).

the last thoracic somite. There is also an anterior series of six arthrobranchiæ, and a posterior series of five (p. 760, fig. 4, *arb*), disposed as in *Astacus*. But instead of the two rudimentary pleurobranchiæ borne by the twelfth and thirteenth somites, in *Astacus*, there are three perfect branchiæ attached to the eleventh, twelfth, and thirteenth somites (fig. 4, 11–13 *plb*), in positions which, in the case of the two latter, exactly correspond with those of the rudimentary pleurobranchiæ of *Astacus*.

The pleurobranchiæ and the arthrobranchiæ are very similar to those of *Astacus*; but the inner surface of the stem is channelled by a sort of groove, the edges of which are pretty sharp. I could find no hooks, nor spines, nor hooked papillæ on any part of these branchiæ.

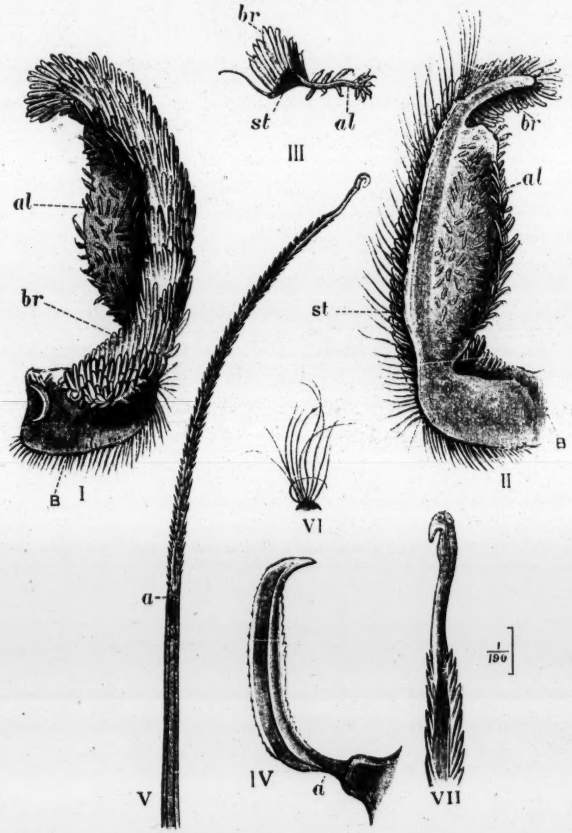
The podobranchiæ (fig. 5, I, II, III) resemble those of *Astacus* in their general form; but the basal portion is relatively larger and the stem stouter, while, at first sight, the lamina appears to be altogether wanting. Close examination, however, shows that the apex of the branchia is distinguishable into an apical plume and a lamellar appendage, but that the latter is relatively very small; in fact, it is a mere outgrowth of the inner wall of the stem, and is neither bilobed nor plaited. Moreover its surface is beset with numerous filamentous prolongations, which are altogether similar to ordinary branchial filaments, except that the extremity of each, instead of being smooth and rounded, is provided with a short recurved hook-like seta (fig. 5, II *a*, IV). The groove on the inner or posterior face of the stem is broader than in *Astacus*. It is bounded on the inner side by a decurrent fringe, which runs down onto the base and stops there, as in the foregoing genera (fig. 5, II). This fringe is provided with long slender curved setæ, each beset with imbricated scales and terminated by a recurved hook (fig. 5, V). The external ridge is wider than in *Astacus*, and is provided with similar hooked setæ. It may be said, in fact, that the whole lower half of the posterior margin of the stem in *Astacopsis* has the character of the posterior margin of the base, while in *Astacus* there is a sharp demarcation between the base and the stem.

In principle, therefore, the podobranchiæ of *Astacopsis* are similar to those of *Astacus*; and the main difference between the two is that the lamina in the former is represented by a slight expansion of the stem, which is neither bilobed nor plaited, while its surface is covered with cylindrical filaments terminated by hooked spines. In *Astacus*, as in *Cambarus*, on the other hand, the lamina is large, bilobed, plaited, and the place of the filaments is taken by mere papillæ terminated by similar hooks. Moreover, in *Astacus* and *Cambarus* the setæ of the base are not hooked.

The appendage of the first maxillipede is similar to that of *Astacus* in form; but on the outer surface of the outer lobe there are sixteen or eighteen short branchial papillæ, some of which, but apparently not all, are terminated by hooks; in fact, except in size, they quite resemble the filaments of the other branchiæ.

In this Crayfish, therefore, the first podobranchia is not reduced

Fig. 6.



Cheraps (?).

I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side (×3). II. The inner face of the same podobranchia: B, basal portion; *st*, stem; *al*, ala; *br*, branchial filaments. III. A transverse section of the middle of the podobranchia (×3). IV. A sickle-shaped hook of a branchial filament $\frac{1}{170}$ of an inch in length. V. One of the coxopoditic setæ more highly magnified: *a*, the circumferential inflexion of the wall of the seta. The central canal does not stop at this point, but is continued to the end of the seta. VI. A bundle of coxopoditic setæ (× 3). VII. The extremity of one of the long setæ of the posterior edge of the stem. The vertical line represents $\frac{1}{190}$ of an inch magnified to the same extent.

to a mere epipodite, but retains true branchial characters in the scanty respiratory filaments of its outer lobe.

There are only small tufts of short, straight or slightly curved setæ in the position of the bundles of long coiled coxopoditic setæ of *Astacus* and *Cambarus* (fig. 5, VI).

The Branchial formula of Astacopsis.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ.		Pleurobranchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep *r*)	0	0	0	= 0 (ep *r*)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
	6+ep *r*+6	+ 5	+	4	= 21+ep *r*.

Thus *Astacopsis* presents a much nearer approximation to the hypothetically complete branchial formula than *Astacus*, inasmuch as the epipodite of the first maxillipede is an imperfect branchia, and there are four complete pleurobranchiæ: only the hindermost podobranchia, the first and last anterior arthrobranchiæ, the first two and the last posterior arthrobranchiæ, and the first four pleurobranchiæ are wanting. In fact, this is the most complete branchial formula with which I am at present acquainted, among the podophthalmous Crustacea.

4. *The Branchiæ of* Chæraps (?).

I have examined a single specimen of a species attributed to this genus, from the Yarra-Yarra river, in the collection of the British Museum[1].

The second maxillipede and the five following thoracic limbs bear podobranchiæ, which increase in length from the first to the last, and have a close general resemblance to those of *Astacopsis*; but they differ in the production of the upper part of the anterior lip of the groove of the stem into a broad limb or ala, wider at the upper end than below, which must not be confounded with the lamina of *Astacus*, as it corresponds only with part of the inner lobe and the decurrent fringe in that genus (fig. 6, I, II, III *al*). Both faces, as well as the free posterior margin of this fringe, are beset with cylindrical branchial filaments, the apex of each of which is terminated by a strong sickle-shaped hook (fig. 6, IV). The majority of the branchial filaments of the stem are also terminated either by smaller hooks or by short straight spines. Long setæ, hooked at

[1] My best thanks are due to Dr. Günther, F.R.S., for the readiness with which he has aided my investigations by giving me free access to the Crustacean collection under his charge.

the ends, and otherwise similar in structure to those of *Astacopsis*, are attached to the posterior edge of the stem of the podobranchia (fig. 6, VII).

The ala is widest, and extends furthest towards the summit of the branchia, in the most anterior podobranchia, while in the hindermost it is reduced to little more than a longitudinal ridge. This branchia, in fact, is very similar to one of those of *Astacopsis*.

There are six anterior arthrobranchiæ, which are not more than half as long as the podobranchiæ, and five still smaller posterior arthrobranchiæ, the hindermost of which is almost rudimentary.

As in *Astacopsis*, there are four large pleurobranchiæ, the hindermost of which is only slightly larger than the other three, which are nearly equal in size.

Small branchial filaments are scattered over the whole posterior face of the epipodite of the first maxillipede; and the apex of each is provided with a strong sickle-shaped hook.

The coxopoditic setæ are relatively short, as in *Astacopsis*, but slender and curved, and even slightly undulating (fig. 6, VI). Each is hooked at its free extremity (fig. 6, V).

If the distinctive character of *Chæraps*, as given by Erichson, is correct, this is not a true *Chæraps*; but the branchiæ of these animals are so readily detached, that I can give no opinion on this point without comparison with the original specimens. In any case, the structure of the podobranchiæ shows the distinctness of this form from *Astacopsis*.

The Branchial formula of Chæraps (?).

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0 (ep *r*)	0	0	0	= 0 (ep *r*)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
	6+ep *r*+6	+ 5	+ 4		= 21 + ep *r*.

5. *The Branchiæ of* Engæus.

The number, the general disposition, and the structure of the branchiæ are the same as in *Astacopsis* and *Chæraps*.

The podobranchiæ have no vestige of a lamina. The first podobranchia has a small ala, much as in *Chæraps*; but only a few of the branchial filaments have terminal hooks.

The arthrobranchiæ are very small, those of the posterior series being the smaller; and the three anterior pleurobranchiæ are much smaller than the hindermost.

In all the branchiæ, and especially in the arthrobranchiæ and pleurobranchiæ, the terminal filament is exceptionally long and thick.

There are only a few very small hooked papillary elevations on the epipodite of the first maxillipede; in fact the podobranchia is reduced to nearly the same condition as in *Astacus*. The hooks of the setæ are very slender.

The branchial formula is the same as in *Astacopsis* and *Chæraps*, viz.:—

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0 (ep *r*)	0	0	0	= 0 (ep *r*)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
	6 + ep *r* + 6	+ 5	+ 4		= 21 + ep *r*.

6. *The Branchiæ of* Paranephrops.

In *Paranephrops planifrons* I find the branchiæ to have the same general character and disposition as in *Astacopsis* and *Engæus*.

The podobranchiæ are devoid of any trace of a lamina. The branchial filaments on the posterior faces of these branchiæ are, for the most part, provided with terminal hooks, while the rest have smooth and rounded apices.

The anterior arthrobranchiæ have not half the size of the podobranchiæ, while the posterior arthrobranchiæ are very minute, and the hindermost is rudimentary, being a mere simple filament, like one of the rudimentary pleurobranchiæ of *Astacus*. The pleurobranchiæ are larger, but the three anterior ones are small. None of these branchiæ have hooked papillæ.

The external and posterior face of the epipodite of the first maxillipede is beset with short hooked branchial filaments.

The coxopoditic setæ are few, slender, short, and hooked at the extremity.

The Branchial formula of Paranephrops.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0 (ep *r*)	0	0	0	= 0 (ep *r*)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	*r*	1	= 3 + *r*
XIV.....	0	0	0	1	= 1
	6 + ep *r* + 6	+ 4	+ *r* + 4		= 20 + ep *r* + *r*.

The branchiæ of two specimens of a *Paranephrops*, from the Fiji Islands, like the foregoing in the British Museum, are in such bad condition, the specimens having apparently got dry before they were placed in spirits, that I cannot make out all the details of their structure; but, so far as it can be ascertained, they agree with those of the preceding species.

7. *The Branchiæ of* Parastacus.

By the kindness of Prof. Peters, I have been able to examine two well preserved males of the *Astacus brasiliensis* and *A. pilimanus* of Von Martens; and the results are very interesting.

The branchiæ of the two species are so much alike that they may be described together. In many points they resemble those of *Chæraps*; but the structure is by no means identical; and as these Crayfishes are peculiar in other respects, I think it will be most convenient to consider them as members of a distinct genus, *Parastacus*.

There are six ordinary podobranchiæ, of which, as usual, the first is the smallest, the next two are longer, and the last three are longest of all and nearly equal. In the podobranchia of the second maxillipede, the inner lip of the groove of the stem of the branchia is produced into a broad ala, as in *Chæraps*; but the ala becomes broader towards the apex, and is there abruptly truncated. The truncated edge is fringed by a single series of branchial papillæ. The posterior lip of the groove is beset with long hooked setæ. In the four following podobranchiæ the ala is a little narrower, especially at its apex, but it has essentially the same characters. In the last the ala is present in the basal half of the stem, but narrows to a mere ridge in the apical half.

The modified podobranchia of the first maxillipede bears from ten to sixteen longer or shorter branchial filaments on the outer half of the posterior surface of its apical end (fig. 2, D, p. 759).

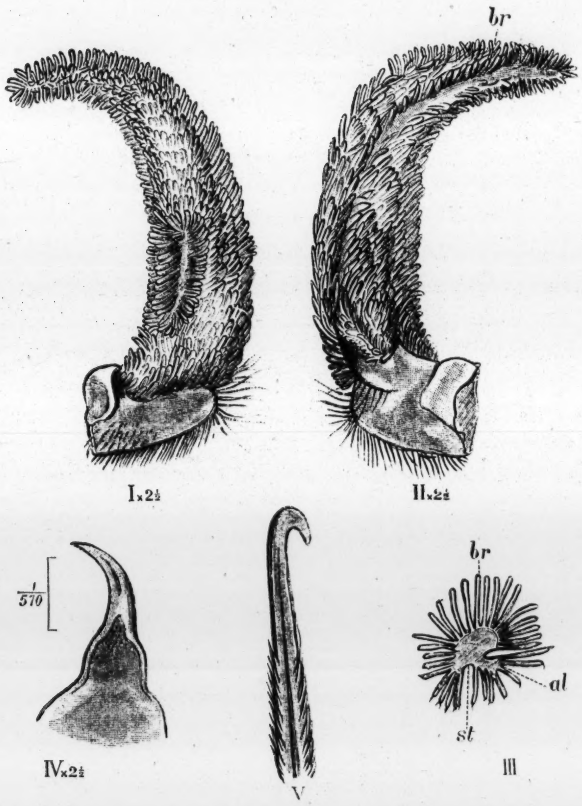
The six anterior arthrobranchiæ are full-sized, and increase in length from before backwards. The five posterior arthrobranchiæ are much smaller; and the last is rudimentary, consisting of a very short slender stem, with from one to three lateral filaments.

There are four pleurobranchiæ, all well developed, but the hindermost the longest.

In the podobranchiæ, many of the posterior branchial filaments are terminated by hooks. As usual, these are absent in the other branchiæ.

The coxopoditic tubercles give origin to bundles of long and tortuous setæ, with hooked apices. These are neither so long, nor so numerous, as in *Astacus* and *Cambarus*, but are more like them than are those of any other *Parastacidæ*.

Fig. 7.



Astacoides madagascariensis.

I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side (×2½). II. The inner face of the same: *br*, branchial filaments. III. A transverse section of the middle of the podobranchia: *st*, the grooved inner face of the stem. IV. The terminal hook of a branchial filament; and V. The apex of a coxopoditic seta. The straight line represents $\frac{1}{5\,1\,0}$? of an inch magnified to the same extent as these.

The Branchial formula of Parastacus.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.		
VII.....	0 (ep *r*)	0	0	0	=	0 (ep *r*)
VIII.....	1	1	0	0	=	2
IX.....	1	1	1	0	=	3
X.....	1	1	1	0	=	3
XI.....	1	1	1	1	=	4
XII.....	1	1	1	1	=	4
XIII.....	1	1	*r*	1	=	3+*r*
XIV.....	0	0	0	1	=	1
	6 +ep *r*+ 6	+	4 +*r*+4		=	20 + ep *r* + *r*.

8. *The Branchiæ of* Astacoides.

I am indebted to the courtesy of Prof. Alphonse Milne-Edwards for the opportunity of examining the branchiæ of a male specimen of the Crayfish of Madagascar, *Astacoides madagascariensis*. On account of the rarity of this species, it is desirable to describe its branchial apparatus in some detail. The length of the specimen was 5·7 inches.

The branchiostegite of the left side being carefully removed, the six large podobranchiæ were seen. The first, 0·9 inch long (measured from its attachment to its apex), was directed upwards and backwards in the cervical depression. The second, 1 inch long, took a similar direction, but was concave forwards. The third, slightly shorter, lay parallel with the second. The fourth (fig. 7, I, II) was much longer; bent round the third, its summit touched the apex of the second; the total length of the branchia when straightened out was about 1·3 inch. The fifth branchia was still longer, curving round the posterior edge of the last, so that its apex touched the front boundary of the branchial cavity. The sixth branchia started from a higher level than any of the others, in consequence of the great size of the coxopodite of the penultimate thoracic limb; its length was 1·05 inch; and it was nearly straight, its apex fitting into the summit of the branchial cavity. The base of each podobranchia is elongated upwards, as in *Astacopsis*; and there is a soft fold of integument over its attachment. There is no trace of any lamina.

On the removal of the podobranchiæ the arthrobranchiæ came into view. But, in contradistinction to all other known Crayfishes, there are only five of them fully developed, and even these are remarkably small in comparison with the podobranchiæ. The first is the shortest (0·5 in.); and they increase in length to the hindermost, which is 0·35 in. long. Each is concave forwards and convex backwards; and the apex of the hindermost comes within 0·15 inch of the nearest part of the anterior superior boundary of the branchial cavity. In all these branchiæ the branchial filaments are very numerous, stiff, relatively short and close-set; so that they

approach the characters of the branchiæ of the Lobster. The groove on the inner face of the stem seems, at first, to be reduced to nothing in the upper part of the podobranchiæ. However, a transverse section (fig. 7, III) shows that it exists and is bounded by two lips, the anterior of which is produced into a narrow ala. But the numerous hooked branchial filaments, which arise from the posterior face of the stem, fill the groove and appear to obliterate it.

The hindermost of the arthrobranchiæ is attached close to the articulation of the coxopodite with the epimeron, and is therefore in the same position as one of the anterior series of arthrobranchiæ in other Crayfishes. There is not the slightest trace of the attachment of another branchia on the arthrodial membrane behind this. But on the epimeron, just above the margin of the articular cavity, and 0·1 inch behind the root of the anterior branchia, a minute filament, 0·05 in. long, which I take to be a rudiment of the posterior branchia, enclosed by the downward extension of the epimeron, projects.

The attachment of the next arthrobranchia is like that of its predecessor, but not quite so far forward. At a distance of 0·5 in. behind and above its root, an exceedingly minute papilla, not more than a fifth of the length of the foregoing, is enclosed in the articular edge of the epimeron. This is doubtless the rudiment of the posterior arthrobranchia. The three remaining arthrobranchiæ are fixed into the arthrodial membranes of the other ambulatory and prehensile limbs, in a position corresponding with that occupied by the fourth. In the case of the hindermost of these, or that of the eleventh pair of appendages, there is, above and behind the root of the gill, and 0·08 inch distant from it, a filamentous rudimentary branchia, rather less than 0·1 inch long, attached within the articular margin of the epimeron. Three or four minute unequal processes are given off from the posterior edge of this filament. There is another very small papillary rudiment immediately above and behind the root of the next arthrobranchia; but none could be discovered above that of the most anterior arthrobranchia.

In addition to the five conspicuous and functional outer arthrobranchiæ, there was another very small one, only 0·18 inch long, and almost rudimentary, attached to the second maxillipede.

The pleurobranchia of the last thoracic somite was only 0·3 inch long, and was hardly visible at first, from being overlapped by the hindermost podobranchia. I could not discover the slightest trace of any other pleurobranchiæ.

The upper part of the modified podobranchia of the first maxillipede is sharply folded upon itself longitudinally; and its outer lobe is beset with numerous short branchial filaments, most of which have terminal hooks. Similar hooked filaments are to be found about the base and the posterior region of the other podobranchiæ; but a large proportion of the filaments of these branchiæ, and all of those of the arthrobranchiæ, appear to be hookless.

The tubercles of the coxopodites give rise to small tufts of short and straight setæ, which are hooked at the end, like those of *Asta-*

copsis (fig. 7, v). The hinder and upper setæ of the bases of the podobranchiæ are similarly hooked; but, as in the other species, the anterior setæ are straight, or only slightly curved at the extremities.

The Branchial formula of Astacoides madagascariensis.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.		
VII.....	0 (ep *r*)	0	0	0	=	(ep *r*)
VIII.....	1	*r*	0	0	=	1 + *r*
IX.....	1	1	0	0	=	2
X.....	1	1	*r*	0	=	2 + *r*
XI.....	1	1	*r*	0	=	2 + *r*
XII.....	1	1	*r*	0	=	2 + *r*
XIII.....	1	1	*r*	0	=	2 + *r*
XIV.....	0	0	0	1	=	1
	6+ep *r*+5	+ *r*	+ 4 *r*	+ 1	=	12+ep *r*+5*r*

In *Astacoides*, therefore, the branchiæ have suffered more reduction than in any other known Crayfish; and this reduction is, as it were, a continuation of the process already commenced in *Engæus* and *Paranephrops*, in which the anterior pleurobranchiæ and the posterior arthrobranchiæ are small, or even rudimentary.

III. The Classification of the Crayfishes.

Whatever may be the variation in the structure of the branchiæ of the different species of Crayfish, it will be observed that they all agree in possessing podobranchiæ, or branchiæ attached to the coxopodites, of the six middle thoracic appendages, and that these are either not at all, or incompletely, differentiated into a branchial and an epipoditic division. Moreover *Astacopsis*, *Chœraps*, *Engæus*, *Paranephrops*, *Parastacus* and *Astacoides*, in which the apices of the podobranchiæ are not separated into a branchial plume and a well developed lamina, present a less-differentiated type of branchial structure than that which obtains in *Astacus* and *Cambarus*.

Thus the structure of the branchiæ in the Crayfishes separates them into two groups, of which I propose to term the latter the Potamobiidæ, and the former the Parastacidæ.

In the Parastacidæ the podobranchiæ are devoid of more than a rudiment of a lamina, though the stem may be alate. The podobranchia of the first maxillipede has the form of an epipodite; but, in almost all cases, it bears a certain number of well-developed branchial filaments.

The first abdominal somite possesses no appendage in either sex; and the appendages of the four following somites are large.

The telson is never completely divided by a transverse suture.

More or fewer of the branchial filaments of the podobranchiæ are terminated by short hooked spines; and the coxopoditic setæ, as well

as those which beset the stems of the podobranchiæ, have hooked apices.

In the POTAMOBIIDÆ the podobranchiæ of the second, third, fourth, fifth, and sixth thoracic appendages are always provided with a large plaited lamina. The podobranchia of the first maxillipede is converted into an epipodite, entirely devoid of branchial filaments.

The first abdominal somite invariably bears appendages in the male, and usually in both sexes. In the male these appendages are styliform, and those of the second somite are always peculiarly modified.

The appendages of the four following somites are relatively small.

The telson is usually completely divided by a transverse suture.

None of the branchial filaments are terminated by hooks; nor are any of the coxopoditic setæ or the longer setæ of the podobranchiæ hooked, though hooked tubercles occur on the stem and on the lamina of the latter.

The coxopoditic setæ are always long and tortuous.

It is worthy of notice that the Parastacidæ agree with the Palinuridæ and Scyllaridæ in the abortion of the appendages of the first abdominal somite, and in possessing hooked setæ, while in the Potamobiidæ, as in the Lobsters, the setæ are not hooked, and, as in almost all the Podophthalmia, except the Palinuridæ and Scyllaridæ[1], the appendages of the first abdominal somite are present, and are specially modified in the males.

Of the six genera of the Parastacidæ, *Astucoides* is widely separated from all the rest by the reduction of the number of its functional branchiæ to twelve, while all the other genera at present known have, at fewest, twenty, and usually twenty-one, branchiæ.

Astacopsis, *Chæraps*, *Engæus*, and *Parastacus* have, in common, a long epistoma, the surface of which is flattened, the basal joint of the antennæ fixed by the overlapping edge of the cephalostegite, the posterior thoracic sterna narrow, the coxopodites of the hinder thoracic limbs large and approximated in the middle line. The rostrum and the antennary squame are short. *Engæus* is distinguished among these, not only by the narrowness of the first abdominal somite, but by the form of the anterior part of the head, with its short and deflexed rostrum, and very small antennary squame.

In *Chæraps* the podobranchiæ are alate, in *Astacopsis* they are not. *Parastacus* somewhat resembles *Chæraps* in its alate podobranchiæ, but differs from all the rest by possessing long and tortuous coxopoditic setæ.

I have nothing to add to the distinctive characters of the two genera of the Potamobiidæ, *Astacus* and *Cambarus*, already given by Erichson, Hagen, and others.

All the branchiæ of the Crayfishes consist of a stem beset with numerous cylindrical filaments. In fact, they are typical examples of what are termed by Milne-Edwards "branchies en brosse," and may be called "trichobranchiæ," in contradistinction to the lamellar

[1] In *Gebia*, *Calliaxis*, and *Porcellana*, the first abdominal appendages are rudimentary or abortive in the male sex.

gills or "phyllobranchiæ," which are met with in a large number of other Crustacea. The whole of the Macrurous Podophthalmia, excepting the genera *Gebia* and *Callianassa*, the Prawns, the Shrimps, and the Mysidæ, have trichobranchiæ.

In the Mysidæ the branchiæ are rudimentary or absent, and in the Euphausidæ and Penæidæ they are peculiarly modified. In the Prawns and Shrimps, in *Gebia* and *Callianassa*, in all the Anomura and Brachyura, the gills are phyllobranchiæ.

Thus the Podophthalmia or Thoracostraca (to use the convenient name proposed by Prof. Claus) are divisible in respect of the structure of their respiratory organs into three groups, which may be termed Abranchiata, Trichobranchiata, and Phyllobranchiata.

Among the trichobranchiate Podophthalmia, the Euphausidæ possess no other than podobranchiæ[1]. These are mere respiratory plumes presenting no differentiation even into base and stem. All the rest of the Trichobranchiata have arthrobranchiæ, either with or without functional podobranchiæ and pleurobranchiæ. Among those which possess all three kinds of branchiæ, the Parastacidæ and the Palinuridæ are highly exceptional among the Thoracostraca in the absence of the appendages of the first abdominal somite in both sexes. They further, as a rule, possess 21 branchiæ (*pdb.* 6, *arb.* 11, *plb.* 4), though the number is, in some cases, reduced by the suppression of more or fewer of the arthrobranchiæ and pleurobranchiæ.

In most, if not all the other Trichobranchiata, the first abdominal appendages of the males are present and specially modified. Among these, the Potamobiidæ are characterized by the imperfect division of their podobranchiæ into a proper branchial and an epipoditic portion.

In *Homarus* and *Nephrops*, *Axius* and *Thalassina*, the podobranchiæ are completely differentiated, from their bases onward, into a proper branchial and an epipoditic portion. In this condition the podobranchia is usually described as an epipodite, to the base of which a branchia is attached.

In *Homarus* the branchial filaments are numerous and multiserial, and the branchial formula is:—

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ.		Pleurobranchiæ.	
		Anterior.	Posterior.		
VII. . . .	0 (ep)	0	0	0	= 0 (ep)
VIII. . . .	1	0	0	0	= 1
IX. . . .	1	1	1	0	= 3
X. . . .	1	1	1	0	= 3
XI. . . .	1	1	1	1	= 4
XII. . . .	1	1	1	1	= 4
XIII. . . .	1	1	1	1	= 4
XIV. . . .	0	0	0	1	= 1
	6+ep	+ 5	+ 5	+ 4	= 20+ep.

[1] Possibly some of the branchial plumes in *Sergestes* may be attached to the arthrodial membranes. A critical examination of the species of *Sergestes* in reference to this point would probably yield interesting results.

In *Nephrops* the branchiæ have the same structure, but the branchial plume of the podobranchia of the second maxillipede is absent or rudimentary; hence the number of the branchiæ is reduced to 19.

In *Axius* the podobranchia of the penultimate thoracic limb is reduced to an epipodite by the disappearance of the branchial plume, and the hindermost pleurobranchia is also wanting. The arthrobranchia of the second maxillipede is represented by a mere rudiment.

The Branchial formula of Axius stirhynchus.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0 (ep)	0	0	0	= 0 (ep)
VIII.....	1	*r*	0	0	= 1+*r*
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	0 (ep)	1	1	1	= 3+ep
XIV.....	0	0	0	0	= 0
	5+2 ep	+5+*r*	+ 5	+ 3	= 18+2 ep+*r*.

The branchial filaments in this genus, again, are arranged only in two series on the stem, though, as they remain filiform, the approximation to the phyllobranchiate type is but slight.

In *Homarus*, *Nephrops*, and *Axius* the epipoditic divisions of the podobranchiæ are very large; but in *Thalassina*, *Stenopus*, and *Penæus* they are much reduced in size, and the branchial element disappears in more than the hindermost.

In *Thalassina scorpioides* the last thoracic somite is provided with no branchiæ of any kind, nor have its limbs any epipodite, and there are no pleurobranchiæ. The podobranchiæ of the twelfth and thirteenth somites are reduced to stout curved setose epipodites. In the eleventh there is a similar epipodite, but a branchial plume springs from its base. The tenth had a small epipodite, without a branchia in the specimen examined; but I am inclined to think that the branchia may have become detached; for the similar epipodite of the external maxillipede bore a mutilated, or rudimentary, small branchia. The small epipodites of the second maxillipedes figured by Milne-Edwards were broken off; but the places to which they were attached were discernible. The first maxillipede had no epipodite, in which respect *Thalassina* approaches *Callianassa*.

There are twelve arthrobranchiæ attached in pairs, from the second maxillipede to the penultimate thoracic limb inclusively. All these branchiæ are remarkable from the fact that, for a greater or less distance from the base of the gill, the stem is provided with broad imbricated foliaceous expansions, which are traversed by ramified

vessels, and take the place of the branchial filaments, which are sometimes very few, and confined altogether to the basal region of the branchia. These branchial plates differ from those of the true phyllobranchiæ in their small number and in their disposition, inasmuch as they are directed obliquely to the stem and not at right angles to it. Nevertheless it is interesting to find, in both *Axius* and *Thalassina*, a certain approach to the phyllobranchiate type, which is completely reached in *Gebia* and *Callianassa*.

The Branchial formula of Thalassina.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0	0	0	0 =	0
VIII.....	0 (ep)	1	1	0 =	2 +ep
IX.....	1	1	1	0 =	3
X.....	1	1	1	0 =	3
XI.....	1	1	1	0 =	3
XII.....	0 (ep)	1	1	0 =	2 +ep
XIII.....	0 (ep)	1	1	0 =	2 +ep
XIV.....	0	0	0	0 =	0
	3+3 ep	+6 +	6	+ 0 =	15+3 ep.

In *Stenopus hispidus* the branchiæ resemble those of *Astacopsis* in structure, the filaments being loose, slender, and multiserial. But the disappearance of the branchial plumes from the podobranchiæ has gone still further than in *Thalassina*; and all these organs are reduced to delicate, almost vesicular epipodites entirely devoid of any proper branchial filaments, except in the case of the second maxillipede, in which a few such filaments are attached to the base of the epipodite. Moreover the number of the pleurobranchiæ is increased to seven.

The Branchial formula of Stenopus.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.	
VII.....	0 (ep)	?	0	0 =	(ep)
VIII.....	0 (ep *r*)	1	1	1 =	3+ep *r*
IX.....	0 (ep)	1	1	1 =	3+ep
X.....	0 (ep)	1	1	1 =	3+ep
XI.....	0 (ep)	1	1	1 =	3+ep
XII.....	0 (ep)	1	1	1 =	3+ep
XIII.....	0 (ep)	1	1	1 =	3+ep
XIV.....	0	0	0	1 =	1
	0+7 ep	+*r* + 6 +	6	+ 7 =	19+7 ep+*r*

I am inclined to suspect the existence of a rudimentary anterior arthrobranchia in VII.; but I could not make sure of it.

By the structure of its branchiæ *Stenopus* is sharply separated from *Penæus*, with which it has hitherto been associated, although it approaches *Penæus* in the almost complete abortion of the branchial element of the podobranchiæ. In the Penæidæ, in fact, each branchia consists of a stem which is pointed at both ends and gives off two series of opposite lateral branches. This stem is attached by a pedicle near its lower end. Near each end of the stem the lateral branches are very short, and stand straight out; but they rapidly become longer; and as they do so they curve outwards towards one another, and eventually meet in the middle line. The middle of the branchia consequently assumes the form of a hollow cylinder.

The outer face of each lateral branch gives off a close-set series of secondary branches, which diminish in size towards the free end of the lateral branch, and at the free end are simple undivided filaments. But towards the attached end of the branch the secondary branches are themselves dichotomously subdivided in the direction of their length; so that the most complicated of these secondary branches presents a short stem whence two branches proceed, each of these again gives off two, and these may terminate in yet other two. Hence each secondary branch is like a flat triangular plate slit by fissures of varying depths, and attached by its apex to a lateral branch. All these secondary branches are directed upwards and outwards.

A detached lateral branch closely resembles one of the branchiæ of *Thysanopoda*; while, so far as I can judge from the figures given by Kröyer[1] and Sars[2], the branchiæ of *Sergestes* and *Lophogaster* still more closely approach those of *Penæus*.

A similar structure was described by Duvernoy in *Aristæus*, and was supposed by him to be characteristic of that genus; but Dana has already justly expressed a doubt whether, in this respect, *Aristæus* differs from the other Penæidæ.

In *Penæus*, the last and the penultimate thoracic limbs present no trace of podobranchiæ; and in all the rest the podobranchia is reduced to a small epipodite, which, in the middle of the series, is bifurcated at its free end. The latter lies between the arthrobranchiæ of its own somite and the next following. There are seven pleurobranchiæ, of which the hindermost is the largest, while the most anterior is very small.

[1] Forsög til en monographisk Fremstilling af Kraebsdyrslagten *Sergestes*: 1855.

[2] Beskrivelse over *Lophogaster typicus*: 1862.

The Branchial formula of Penæus brasiliensis.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.		
VII.....	0 (ep)	1 (small)	0	0	=	1+ep
VIII.....	0 (ep)	1	1	1	=	3+ep
IX.....	0 (ep)	1	1	1	=	3+ep
X.....	0 (ep)	1	1	1	=	3+ep
XI.....	0 (ep)	1	1	1	=	3+ep
XII.....	0 (ep)	1	1	1	=	3+ep
XIII.....	0	1	1	1	=	3
XIV.....	0	0	0	1	=	1
	0+6 ep	+7 +	6 +	7	=	20+6 ep.

The arthrobranchia of VII. is very small; in fact, it is a mere tuft of dichotomously divided branchial filaments.

The results of this examination of the principal forms of those Trichobranchiata which possess more than one kind of branchiæ may be thrown into a tabular form, as follows:—

I. No appendages to the first abdominal somite in either sex. *Astyla.*
  1. Podobranchiæ undivided..... PARASTACIDÆ.
  2 Podobranchiæ divided into branchial and epipoditic portions ..... PALINURIDÆ.

II. Appendages of the first abdominal somite almost always present, and specially modified in the males. *Stylophora.*
  1. Podobranchiæ partially divided..... POTAMOBIIDÆ.
  2. Podobranchiæ completely divided or reduced to epipodites.
    a. Pleurobranchiæ not more than four.
      α. Posterior pleurobranchia present, and the most posterior of the podobranchiæ complete ..... HOMARIDÆ. *Homarus, Nephrops.*
      β. Posterior pleurobranchia wanting, and more or fewer of the posterior podobranchiæ reduced to epipodites.
        a. Branchiæ with only filamentous processes..... *Axius.*
        b. Branchiæ with foliaceous as well as filamentous processes ..... *Thalassina.*
    b. Pleurobranchiæ more than four.
      α. Branchiæ filamentous ..... *Stenopus.*
      β. Branchiæ ramose..... *Penæus.*

All the Trichobranchiata are Macrura, in the sense of having the abdomen and its appendages well developed; but, in *Ibacus* and *Thenus*, the abdomen becomes shortened and the cephalothorax wide, while the antennary and the ocular regions are modified in a manner very similar to that which gives rise to the peculiar "face" or "metope" of the typical Brachyura. A very little further modification would convert *Thenus*, for example, into a trichobranchiate Crab. Such forms as these, which simulate the Brachyura, and yet differ profoundly from them, may be termed "pseudo-carcinoids."

If the branchial filaments of *Axius* were shortened and widened, the structure of the branchiæ would approach that which obtains in *Gebia* and *Callianassa*, which are truly phyllobranchiate. But in other respects there is a wide interval between these genera, on the one hand, and *Axius* and *Thalassina*, which are ordinarily associated with them among the Thalassinidæ, on the other hand; for the podobranchiæ have entirely disappeared on the six hinder thoracic limbs, and even on the first or second maxillipede they are represented only by rudimentary epipodites.

There are no pleurobranchiæ; and the total number of gills is reduced to five pairs of arthrobranchiæ on each side.

The Branchial formula of Gebia *and* Callianassa.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.
VII.....	0	0	0	0 = 0
VIII.....	0	0	0	0 = 0
IX.....	0	1	1	0 = 2
X.....	0	1	1	0 = 2
XI.....	0	1	1	0 = 2
XII.....	0	1	1	0 = 2
XIII.....	0	1	1	0 = 2
XIV.....	0	0	0	0 = 0
	0	+ 5	+ 5	+ 0 = 10

In the almost complete abortion of the podobranchiæ, and in the presence of ten arthrobranchiæ attached in pairs to the middle thoracic somites, *Gebia* and *Callianassa* agree with *Porcellana*, *Galathea*, *Lithodes*, *Pagurus*, and *Remipes*. But in *Galathea* and *Porcellana* the four hindermost pleurobranchiæ are present, making fourteen gills on each side; in *Lithodes* and *Pagurus* the penultimate pleurobranchia exists, making eleven; in *Remipes* there is no pleurobranchia, and only nine arthrobranchiæ, viz. one on the ninth and two for each of the four following somites, are present.

In this group, which nearly corresponds with the Anomala of De Haan, and which I propose to term the "Anomomorpha," there is every degree of modification—from such typically Macrurous forms as *Gebia* and *Galathea* to such pseudo-carcinoids as *Lithodes* and *Porcellana*. It is interesting to remark, however, that, while in *Thenus* and *Ibacus* the process of modification has chiefly affected the head, in the Anomomorpha the characteristic changes are more marked in the abdomen. In none of the latter are the basal joints of the antennæ fixed, nor are distinct orbits formed.

It is easy to understand the possibility of the derivation of the Anomomorpha from some form allied to *Axius* and *Thalassina* (but with four pleurobranchiæ) by the further reduction, and final almost complete disappearance, of the podobranchiæ, while the biserial filaments of the other gills flattened out and became lamellar.

The Prawns and Shrimps ("Salicoques" of Milne-Edwards, *Carides*

of De Haan), if we exclude the Penæidæ, constitute a natural assemblage, to which I will apply the name of "Caridomorpha." They are all eminently Macrurous; and the characteristic feature of their branchial system is the predominence of the pleurobranchiæ, and the concomitant diminution in the number and the importance of the arthrobranchiæ and of the podobranchiæ. In fact, so far as I am aware, there are never any traces of the latter except upon the maxillipedes.

In both *Palæmon* and *Crangon* I find five pleurobranchiæ attached to the posterior thoracic somites, from the tenth to the fourteenth inclusively. In *Palæmon*, two arthrobranchiæ, one of which is very small, are attached to the arthrodial membrane of the external maxillipede, which has a very short and rudimentary epipodite. The second maxillipede bears a podobranchia divided into a small branchia and an oval epipoditic plate. In the first maxillipede the place of the podobranchia is occupied by a rounded bilobed lamella.

In *Crangon* none of the maxillipedes bear gills. The epipodite of the first maxillipede is relatively much larger and triangular; that of the second is tongue-shaped and almost vesicular; that of the third is a mere rounded process.

I can find only one arthrobranchia on the ninth somite.

The Branchial formula of Palæmon.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.		
VII.....	0 (ep)	0	0	0	=	0 (ep)
VIII.....	1	0	0	0	=	1
IX.....	0 (ep)	1	1	0	=	2+ep
X.....	0	0	0	1	=	1
XI.....	0	0	0	1	=	1
XII.....	0	0	0	1	=	1
XIII.....	0	0	0	1	=	1
XIV.....	0	0	0	1	=	1
	1+2 ep	+1 +	1 +	5	=	8+2 ep.

From the number of their pleurobranchiæ the Caridomorpha cannot be regarded as a reduced modification of any of the Trichobranchiata, except the Penæidæ and *Stenopus*. But it is easy to derive them from a *Stenopus*-like primitive form by the reduction of the podobranchiæ and the arthrobranchiæ, and the conversion of the five posterior pleurobranchiæ into gills of the lamellar type.

In the Brachyura of Milne-Edwards the disposition of the branchial apparatus is well known to be definite and characteristic. In *Cancer pagurus*, for example, there are nine branchiæ; seven of these are pyramidal in form, and take a general direction from the base towards the apex of the branchial chamber, to the inner walls of which they are applied. The two posterior of these gills are pleurobranchiæ, being attached respectively to the epimera of the eleventh and the twelfth somites. The fifth and fourth, the third and second,

are fixed in pairs by a common pedicle to the arthrodial membrane of the appendages of the tenth and ninth somites—that is, the great forceps and the third maxillipede. The most anterior gill, slenderer than the others, is attached to the arthrodial membrane of the second maxillipede. There are therefore five arthrobranchiæ.

The podobranchia of the first maxillipede is represented only by the large curved epipodite, which sweeps over the surface of the arthrobranchiæ and the pleurobranchiæ. The podobranchia of the second maxillipede is divided into a branchial plume, which lies horizontally under the bases of the four anterior arthrobranchiæ, and an epipodite, which ascends between the arthrobranchia of its somite and those of the next, and lies internal to the latter, close to the inner wall of the branchial cavity.

In the third maxillipede the epipodite is very long, and forms the valve to the afferent aperture of the branchial cavity. Attached to its base is a short truncated branchia, which fits in between the bases of the second and the third arthrobranchiæ.

The Branchial formula of Cancer pagurus.

Somites and their appendages.	Podo-branchiæ.	Arthrobranchiæ.		Pleuro-branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep)	0	0	0 =	0 (ep)
VIII.....	1	1	0	0 =	2
IX.....	1	1	1	0 =	3
X.....	0	1	1	0 =	2
XI.....	0	0	0	1 =	1
XII.....	0	0	0	1 =	1
XIII.....	0	0	0	0 =	0
XIV.....	0	0	0	0 =	0
	2 + ep	+ 3 +	2 +	2 =	9 + ep.

A considerable reduction of the branchial apparatus occurs in some Brachyura, especially the *Catometopa*. Thus, in *Gelasimus* the hinder pleurobranchia and the most anterior arthrobranchia have disappeared, and the two podobranchiæ are so small as to be almost rudimentary.

In the Raninidæ and in *Latreillia*, the Brachyurous metope is incompletely formed; but the branchial system is essentially that of the true Crabs. The same may be said of *Dromia*, although the branchial apparatus of this crustacean presents some very interesting approximations to the less-modified type from which it cannot be reasonably doubted that the Brachyura have proceeded.

The epipodites of the three maxillipedes are very similar in form and disposition to those of the ordinary Crabs; and that of the second bears a small horizontal branchial plume. That of the third sometimes bears a small branchia. The coxopodite of the fourth thoracic limb has a small epipodite; but I find no trace of such an appendage on the rest of the thoracic limbs. Moreover there are five pairs of arthrobranchiæ attached to consecutive somites from the ninth to

the thirteenth—and four pleurobranchiæ, one for each of the four posterior thoracic somites.

The Branchial formula of Dromia.

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ. Anterior.	Arthrobranchiæ. Posterior.	Pleurobranchiæ.		
VII.....	0 (ep)	0	0	0	=	0 (ep)
VIII.....	1	0	0	0	=	1
IX.....	1	1	1	0	=	3
X.....	0	1	1	0	=	2
XI.....	0	1	1	1	=	3
XII.....	0	1	1	1	=	3
XIII.....	0	1	1	1	=	3
XIV.....	0	0	0	1	=	1
	2 + ep.	+ 5	+ 5	+ 4	=	16 + ep.

On comparing this branchial formula with that of *Homarus*, the relation between the two is obvious. In fact, if the three posterior podobranchiæ of the Lobster are suppressed, and the next is reduced to an epipodite, the branchial formula becomes the same as that of *Dromia*, and the remaining differences between the respiratory organs of the two result from the modification in form and structure of the branchial elements which remain. Thus it is a permissible, if not a probable, suggestion that, just as the Anomomorpha may have been derived from the modification of some form allied to *Axius*, and the Caridomorpha from some form allied to *Stenopus* and *Penæus*, so the Carcinomorpha (= the Brachyura and the Raninidæ, with *Homola* and *Dromia*) may have proceeded from some Homarine stock.

However this may be, the actual morphological relations of the Thoracostraca appear to me to be represented with tolerable accuracy by the following scheme :—

CRUSTACEA.

THORACOSTRACA OR PODOPHTHALMIA.

III. PHYLLOBRANCHIATA.

CARIDOMORPHA. ANOMOMORPHA. CARCINOMORPHA.

II. TRICHOBRANCHIATA.

Penæidæ. *Stenopidæ.* *Thalassinidæ.* *Axiidæ.* *Homaridæ.* *Potamobiidæ.* *Palinuridæ.* *Parastacidæ.*

Euphausidæ.

I. ABRANCHIATA.

Mysidæ.

STYLOPHORA. ASTYLA.

IV. The Distribution of the Crayfishes considered in relation to their Morphological Differences.

From what has been said above, it will be obvious that there is a remarkable correspondence between the morphological and the geographical divisions of the Crayfishes. Thus, all the Crayfishes of the northern hemisphere are Potamobiidæ, and all those of the southern hemisphere are Parastacidæ. In the northern hemisphere, again, the *Astaci* are Eurasiatic and West-American, while the *Cambari* are characteristic of the North-American region east of the Sierra Nevada—in other words, of the river-basins which flow into the Gulf of Mexico and the West Atlantic.

The *Astacine* region nearly answers to the Palæarctic province of Mr. Sclater, minus the southern shores of the Mediterranean, and plus Western North America; while the *Cambarine* region takes in most of the Palæarctic region, with the Neotropical region as far as Guatemala and the West Indies.

In the southern hemisphere, *Astaçopsis*, *Chæraps*, and *Engæus* are confined to the Australian region, *Paranephrops* to New Zealand and the Fijis; while the South-American *Parastacus* is distinct from either of these, though closely allied with the Australian forms; and the peculiarity of the Madagascar fauna is vindicated by *Astacoides*.

Thus, if we were to establish provinces of distribution on the Crayfishes alone, they would bear only a partial resemblance to those based on the association of terrestrial animals. On the other hand, if we compare the distribution of the Crayfishes with that of the freshwater fishes, there are, as might be expected, some curious points of resemblance. The distribution of the Salmonidæ, for example, corresponds pretty closely with that of the Potamobiidæ, though the range of the Salmonidæ extends less far to the south in North America, and a little further, namely, as far as Algeria in the Old World. Again, the Salmonidæ to the east of the Rocky Mountains are, for the most part, distinct from those to the west, while the genus *Onchorhynchus* is, like *Astacus*, common to both the Asiatic and the American shores of the North Pacific.

With the singular exception of *Retropinna*, there is no true Salmonoid in the southern hemisphere; but, as Dr. Günther has pointed out, the Haplochitonidæ and the Galaxiadæ, which stand in somewhat the same relation to the Salmonidæ as the Parastacidæ do to the Potamobiidæ, represent the Salmonidæ in the fresh waters of New Zealand, Australia, and South America.

It is worthy of remark that the Salmonidæ, the Haplochitonidæ, and the Galaxiadæ are singular among Teleostean fishes for the embryonic character of their female reproductive organs, which have no oviducts—just as, among the Podophthalmous Crustacea, the Crayfishes are distinguished by the undifferentiated character of their podobranchiæ.

With the exception of one or two species in Algeria and Asia Minor, the Salmonoids and their allies are wanting in the whole of

Africa and Asia south of the great Asiatic highlands, just as the Crayfishes are. It will be very interesting to learn, from the thorough investigation of the fauna of Madagascar, which is now being carried out, whether the Salmonoids or their allies are in any way represented there.

The broad similarity in distribution between the Salmoniform fishes and the Crayfishes is doubtless due to the likeness of the conditions under which the two groups have reached their present development. I do not think that there can be any reasonable ground for questioning the assumption, that both the freshwater fishes and the freshwater Crustacea are modifications of a marine prototype, which has more or less completely adapted itself to freshwater conditions. In the case of the Crayfishes, at any rate, there is abundant analogical evidence in support of this hypothesis. It is well known that, in many parts of the world, the Prawns ascend rivers, and become fluviatile. The *Palæmon lacustris* (*Anchistia migratoria*, Heller) of the Lago di Garda is identical with a Prawn now living in the Mediterranean. Again, the *Mysis relicta* of the lakes of Norway, Sweden, Western Russia, and North America (Michigan and Superior) is only a variety of the *Mysis oculata* of the Arctic seas [1]. Nor do I think it can be seriously questioned that the fluviatile and the land Crabs are modified descendants of marine Brachyura.

Let it be supposed that, at some former period of the earth's history, a Crustacean, similar to *Paranephrops* or *Astacopsis* in its general characters, but with the first pair of abdominal appendages fully formed, which we may call provisionally *Protastacus*, inhabited the ocean, and that it had as wide a distribution as *Palæmon* or *Penæus* have at the present day. Let us suppose, further, that the northern form of the genus tended towards the assumption of the Potamobiine, and the southern towards that of the Parastacine type. Under these circumstances, it is easy to understand how such rivers as were, or became, accessible in both hemispheres, and were not already too strongly tenanted by formidable competitors, might be peopled respectively by Potamobiine or Parastacine forms, which, acquiring their special characters in each great river-basin, would bring about the distribution we now witness. As time went on, the *Protastacus* stock might become extinct, or might be represented only by rare deep-water forms, as the Homaridæ are represented in the Indian Ocean only by *Nephropsis*.

Some such hypothesis as this appears to me to be fully justified by the present state of knowledge; and though it cannot as yet be said to be directly supported by palæontological facts, these facts agree with the hypothesis very well as far as they go. For the Mesozoic marine

[1] G. O. Sars, 'Histoire Naturelle des Crustacés d'eau douce de Norvége.' In the British Museum there is a species of that especially marine genus *Penæus*, which is affirmed by the Messrs. Schlagintweit to have been obtained from an affluent of the Sutlej, at the foot of the Himalayas. *Penæus brasiliensis* ascends the North-American rivers for long distances (Smith, in Prof. Baird's Report, 1872-72).

strata abound in Crustacea, such as *Glyphæa* and *Hoploparia*, which are evidently closely allied to the Crayfishes.

The great difficulty is, not to account for the Crayfishes where we find them, but to understand their absence over so large a part of the Old World and of intertropical America. Whether this is to be explained by extensive alterations in geographical conditions since the extinction of the *Protastacus* stock, or by the competition of Prawns and freshwater Crabs, or by some other circumstance at present unknown, is a very interesting subject for further inquiry.

Postscript, Oct. 24, 1878.

Since this paper was read, my friend Mr. Moseley, F.R.S., has written for and obtained specimens of the "Crayfish" said to exist in the fresh waters of the Cape-Verd Islands. They belong to the genera *Atya* and *Palæmon*. Moreover, by the intervention of Sir Joseph Hooker, I have procured a considerable number of freshwater Crustacea from Jamaica. But these also all belong to *Atya* and *Palæmon*. I suspect that all Sloane's "Crayfishes" are simply Prawns. The largest example of one of the species sent to me measures sixteen inches in length when the great chelate limbs are fully extended.—T. H. H.

November 5, 1878.

Arthur Grote, Esq., V.P., in the Chair.

The Secretary read the following reports on the additions to the Society's Menagerie during the months of June, July, August, September, and October 1878:—

The total number of registered additions to the Society's Menagerie during the month of June was 159, of which 35 were by birth, 75 by presentation, 29 by purchase, 14 were received on deposit, and 6 by exchange. The total number of departures during the same period, by death and removals, was 73.

The most noticeable additions during the month of June was as follows:—

A Japanese Wolf (*Canis hodophylax*, of the 'Fauna Japonica,' Mamm. t. 9, p. 38), presented by H. Heywood Jones, Esq., F.Z.S., June 26th, being the first example of this little-known animal we have ever received alive.

Judging from the present specimen the Japanese Wolf, although nearly allied to *Canis lupus*, would seem to be a distinct species, to be recognized by its smaller size and shorter legs.

The Japanese Dog sent to us by Mr. Pryer (see P. Z. S. 1878, p. 115) is quite a different animal, and is, I have no doubt, only a variety of the domestic dog or a hybrid.

The registered additions to the Society's Menagerie during the month of July were 154 in number; of these 68 were acquired by presentation, 45 by purchase, 7 by exchange, 18 were bred in the Gardens, and 16 were received on deposit. The total number of departures during the same period by death and removals was 108.

The most noticeable additions during the month were:—

1. A male Beatrix Antelope (*Oryx beatrix*), presented 10th July, 1878, by Commander F. M. Burke, of B. I. S. N. SS. 'Arcot.'

Capt. Burke writes me that he obtained this animal at Jeddah from a friend of his, who received it as a present from the Shereff of Mecca. It had been originally captured in the neighbourhood of Tyeff or Tayf, some 150 miles E.S.E. from the Red Sea, in the Hedjaz passes.

I am sorry to have to add that this interesting animal (so far as I know, the third[1] specimen of its species known) reached the Gardens in a very poor state of health, and died shortly afterwards.

2. A fine young female Orang (*Simia satyrus*) received in exchange from the Zoological Gardens of Calcutta, July 27th.

The registered additions to the Society's Menagerie during the month of August were 117 in number. Of these 40 were acquired by presentation, 12 by purchase, 13 were bred in the gardens, 14 were obtained by exchange, and 38 were received on deposit. The total number of departures during the same period, by death and removals, was 116.

The most noticeable additions during the month were:—

1. One Spanish Blue Magpie (*Cyanopolius cooki*), presented August 2nd, by Lord Lilford, F.Z.S.

2. A young example of the Prairie-Wolf of North America (*Canis latrans*), presented by Prof. C. M. Vincent, F.G.S., F.R.G.S., August 21st.

Both these species are new to the Society's collection.

3. Three hybrid Boas, bred between a male of *Chilobothrus inornatus* and a female *Epicrates angulifer*, and born on the 30th of August.

There can be no question about the paternity of these curious hybrids, as there is no male *Epicrates* in the collection, and the *Chilobothrus* was observed *in copulâ* with her in March or April last.

The three young ones were brought forth alive on the 30th of August; and six eggs, more or less decomposed, came away subsequently.

So far as I know, hybridism among the Ophidians in captivity has not yet been recorded, and in this instance is the more singular as occurring between species of different genera.

The total number of registered additions to the Society's Menagerie during the month of September were 85 in number; of these, 43 were acquired by presentation, 4 by purchase, 13 by birth, and

[1] For a notice of two previous specimens, see P. Z. S. 1857. p. 158, Mamm., pl. lv., and P. Z. S. 1872, p. 603.

25 were received on deposit. The total number of departures during the same period, by death and removals, was 73.

The most noticeable additions during the month were as follows:—

1. An Oriental Eagle-Owl (*Bubo orientalis*), from Karennee, in the interior of Siam, presented September 16th by Charles Fowler, Esq., being the first specimen of this remarkable Owl that has been received by the Society.

2. Two fine Ostriches (*Struthio camelus*), presented by the Hon. H. C. Vivian, H.B.M. Consul-General for Egypt; and two Secretary Birds (*Serpentarius reptilivorus*), presented by C. Rivers Wilson, Esq., C.B.; received September 19th. These birds are from the collection of the Khedive of Egypt, at Cairo.

The total number of registered additions to the Society's Menagerie during the month of October 1878 was 93, of which 4 were by birth, 43 by presentation, 21 by purchase, 20 were received on deposit, and 5 by exchange. The total number of departures during the same period, by death and removals, was 123.

The most noticeable additions during the month of October were as follows:—

1. A female Sumatran Rhinoceros (*Rhinoceros sumatrensis*), deposited by Mr. C. Jamrach, October 4th. This Rhinoceros, which is full-grown, seems to agree in every respect with the two females of the same species previously purchased (in 1872 and 1875[1]).

2. Two Leopard Tortoises (*Testudo pardalis*), presented by the Rev. G. H. R. Fisk, C.M.Z.S., of Capetown, October 9th. Mr. Fisk writes to me as follows respecting these Tortoises:—

"I am informed by Mr. Foster, of Clanwilliam, that in the year 1846 two full-grown Leopard Tortoises were transferred from Kaffirland to Clanwilliam, where they remained for many years without progeny, but that in the year 1857 these two young ones were hatched from the eggs of the female. We arrive, then, at the interesting fact, speaking of a Tortoise after the manner of men, which, perhaps, we may do of a Vertebrate, that these Tortoises are now of age, having lived just twenty-one years, and yet, according to the nature of Tortoises, are only children; for I am assured that they are in size scarcely two thirds of that of their parents, which died early in the year 1877, and within three months of each other.

"I wish to bestow on this Tortoise and its fellow the popular names of Kreli and Sandilli, in remembrance of the land inhabited by their ancestors, and of the war just ended between the Colony and those chiefs who will ever find a place in the history of the Cape."

3. A young male Tufted Deer (*Elaphodus cephalophus*[2]), purchased October 15th, being the second example of this rare and little-known animal received alive. Having been caught in a trap, it is unfortunately deficient in one of its fore feet.

4. A female of the new Fallow-deer lately described by Sir Victor Brooke in the Society's 'Proceedings' (P. Z. S. 1875, p. 261)

[1] See Trans. Zool. Soc. ix. p. 659, et P. Z. S. 1876, p. 694.

[2] See P. Z. S. 1876, p. 273 et pp. 757, 758.

as *Cervus mesopotamicus*, purchased October 31st. This makes a pair of this fine Deer now in the Society's Gardens. Like the male obtained in 1877, the present specimen was obtained at Bussorah and brought to England by our energetic correspondent Capt. Phillips, of the S.S. 'Mesopotamia.'

I take this opportunity of recording the following facts relating to some hybrid Monkeys lately born in the Society's Menagerie, which Prof. Garrod has kindly put together for me:—

During the earlier months of the present year (1878) there were, together in one cage, three Monkeys along with others of smaller size and less developed. The three were:—(1) a male of *Macacus cynomolgus*, or of one of the allied local forms, from Upper Burmah (presented on May 19th, 1875), a particularly fine specimen; (2) a female adult *Cercocebus fuliginosus* (presented on the 3rd of April, 1876); and (3) a female Mandrill, *Cynocephalus mormon* (presented on the 5th of September, 1877), not adult.

The keepers of the House assert that they repeatedly observed the male Macaque in copulation with both females.

On October 2nd the Mangabey fell down from a high perch in her cage dead. All organs, including the brain, appeared quite healthy on postmortem examination. The uterus contained a fœtus far advanced in growth, apparently lacking about three weeks or a fortnight of full development.

On October 14th the Mandrill gave birth to a live young one, which still survives.

There seems no reason to doubt that the Macaque was the father of both the young ones, there being no male Mandrill nor Mangabey which could have had access to them, and the Mandrill's young one having a short tail[1].

The following note was read from Mr. J. H. Gurney, F.Z.S.:—

"Northrepps Hall, Norwich,
July 30, 1878.

"In the 'Proceedings' of the Society for the present year, mention is made at page 354 of two specimens of *Asturinula monogrammica*, procured by Mr. E. C. Buxton at Darra-Salam, on the eastern coast of Africa.

"One of these skins was presented by Mr. Buxton to the Norwich Museum, accompanied by the following memorandum:—'Sings like any thing of an evening and, I believe, morning.'

"I am not aware that this habit of *A. monogrammica* has been previously noticed; and as it appears to indicate an affinity between this species and the genus *Melierax* (which *Asturinula* also resembles when adult, in the remarkable red coloration of the cere, tarsi, and feet), I think Mr. Buxton's short note on the subject ought to be recorded. "J. H. Gurney."

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[1] *Cf.* Blyth's notice of a hybrid Monkey between *Macacus nemestrinus* and *Cynocephalus porcarius* in J. A. S. B. xxxii. p. 455 (1863).

The Secretary read the following extract from a letter addressed to him by Dr. A. B. Meyer, C.M.Z.S., of the Royal Zoological Museum, Dresden:—

"Mr. Van Musschenbroek, the well-known discoverer of *Diphyllodes gulielmi* III., tells me that one of his colleagues in the Moluccas received about ten years ago from the west coast of New Guinea (*viâ* Aru Islands) a Bird-of-Paradise as large as *P. apoda*, but in general like *P. minor*, with this difference, that the whole body was covered with orange-coloured feathers. This bird was presented to the king of Holland; but never was any thing heard of it again. In the year 1875 Mr. Van Musschenbroek saw in the hands of Prof. Steere, at Menado, among a collection of bird-skins which the latter had bought at Amboina, a specimen of *P. minor* which reminded him of the orange Bird-of-Paradise mentioned above. This specimen was spotted with yellow all over; but it was a bad skin, and gave Mr. Van Musschenbroek the impression that it had belonged to a sick bird.

"Are these individual varieties of *P. minor*? or have we to deal with a new and unknown Bird-of-Paradise?"

A communication was read from the Marquis of Tweeddale, President, pointing out that a correction made in the proof of his last paper on Philippine Birds, *antea*, p. 611, had been through some mistake overlooked. The correct specific name of the *Polyplectron* there mentioned, page 623, was *napoleonis*, Lesson, not *emphanes*, Temminck, Lesson having given a description of his bird in the additions and corrections to his 'Traité d'Ornithologie,' page 650.

The following extract was read from a letter addressed to Lord Tweeddale by Mr. A. H. Everett, dated Singapore, July 21, 1878:—

"Just before leaving Manilla I paid a visit to the small museum attached to the College of St. Thomas. There were a few bird-skins; but the room was very dark, and, being with a party of friends, I could not make any satisfactory notes. My visit was, however, repaid by finding a specimen of the Wild Ox of Celebes (*Anoa depressicornis*), which had been brought from Mindoro. I had been led to suspect its existence in that island, but had hitherto failed to get any tangible evidence. I cannot say whether the Philippine animal is identical with that found in Celebes or not. The Professor of Natural History, who had no idea of the interest attaching to his specimen, although he had labelled it correctly, said that he had never heard of the *Anoa* being found at that part of the world, except in the rugged interior of Mindoro, where, however, it abounded. It is not easy to weigh the full import of the occurrence of this singular animal in the Philippines until something more is known about the fauna of Mindoro. I had previously been disposed to doubt the existence of another Celebesian animal, the black *Cynopithecus*, in the islands; but I now feel less confidence on this point, and it is quite possible that it may turn up in Mindoro."

Professor Newton, M.A., F.R.S., V.P., exhibited the skin of a bird supposed to be a hybrid between the Red Grouse (*Lagopus scoticus*) and the Ptarmigan (*L. mutus*), observing:—

"This remarkable specimen was lately given to me for the museum of the University of Cambridge by Capt. Houston, of Kintradwell, in Sutherland, having been shot there out of a covey of Grouse on the 1st of September, 1878. As will be seen, it bears some considerable resemblance, above, to a hen Ptarmigan in summer plumage; but its general appearance is much darker. Beneath, there is a greater resemblance to the young of the Red Grouse; and the primaries are much as in that bird, being, however, partially edged with white to a much greater extent than is commonly found in the latter. I have shown the skin to several ornithological friends, none of whom have been able to offer any other suggestion concerning it than that originally made by the donor, namely that it is a hybrid between the two species named; and in confirmation thereof, Capt. Houston told me that the part of his ground on which it was shot is close to a locality frequented by the Ptarmigan. Without having made an exhaustive search, I may say that I am not aware of any record of such a hybrid as this is supposed to be, though information received from several quarters induces me to believe that other examples have before now occurred; and my chief object in exhibiting the present specimen is to call attention to the subject."

The following papers were read:—

1. On a new Species of *Indicator*, with Remarks on other Species of the Genus. By R. Bowdler Sharpe, F.L.S., F.Z.S., &c.

[Received July 18, 1878.]

In an article which I sent to Mr. Dawson Rowley's 'Ornithological Miscellany' (vol. i. part iii.) I gave a revision of the Indicatoridæ, or family of Honey-Guides; and I am now able to add somewhat to the information there recorded.

Indicator conirostris (Cass.): Sharpe in Rowley's Orn. Misc. vol. i. p. 196.

A few specimens of Honey-Guide having in the hasty packing away of my African collection become mislaid in another box, were not available when I wrote my paper on Indicatoridæ. Now that my collection has been added to the British Museum they have been discovered; and I was pleased to find among the missing birds a fine adult specimen of the present species from the interior of Fantee. It was sent to me by Governor Ussher in one of his last collections, and is the first example known from the Gold Coast. I find,

on comparing the two birds, that *I. conirostris* is a very distinct species from *I. minor*, having the head and back strongly washed with deep golden yellow, the centres of the feathers being blackish instead of pale brown as in *I. minor*. This contrast is especially seen in the wings, where the golden edgings to the black feathers stand out in bold relief, and make them very different from the appearance of the South-African species. The Fantee bird measures—total length 6 inches, culmen 0·45, wing 3·6, tail 2·6, tarsus 0·6.

INDICATOR ARCHIPELAGICUS (Temm.): Sharpe, *t. c.* p. 197; id. Ibis, 1877, p. 8.

As already recorded by me (*l. c.*) Mr. Alfred Everett procured a female specimen of this rare species at Bintulu, in North-western Borneo. Temminck's description is not very good; but the species is unmistakable from its yellow shoulder-spot.

INDICATOR EXILIS (Cass.): Sharpe, *t. c.* p. 198.

A specimen of this little Honey-Guide was sent recently from Landana, on the Congo, by M. Petit.

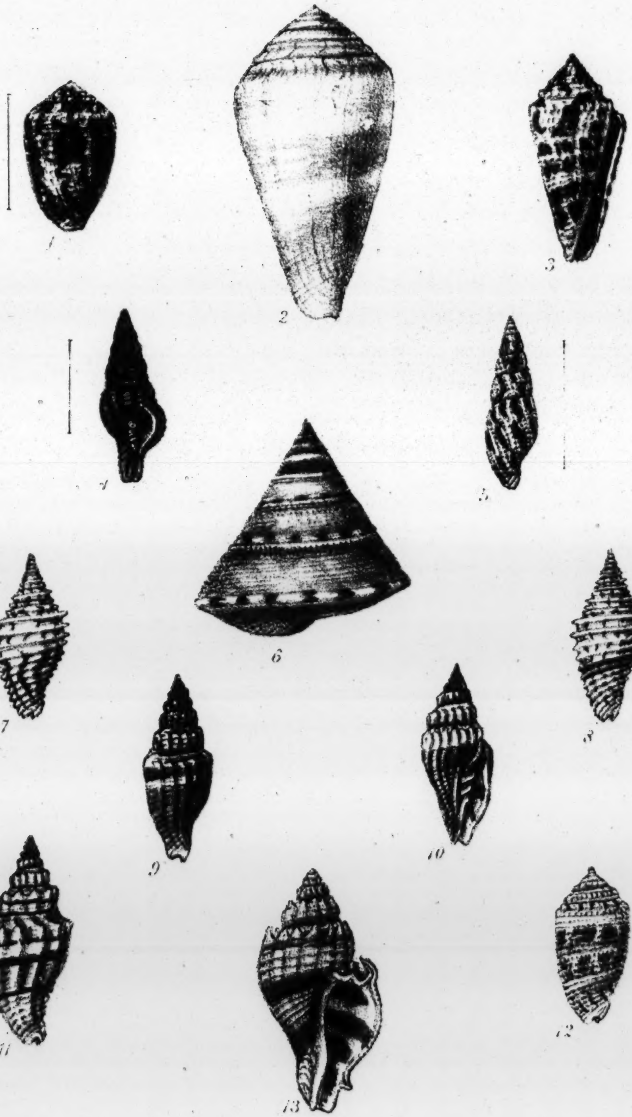
INDICATOR MALAYANUS, sp. n.

General colour above ashy, washed with olive-yellow, dimly on the head and mantle, the feathers of the back and wings more distinctly edged with olive-yellow, the primaries scarcely perceptibly margined; tail-feathers dark brown, edged indistinctly with olive-yellow, all but the two centre tail-feathers internally whity brown, increasing in extent towards the outermost, which is almost entirely whity brown, obliquely dark brown towards the tip; sides of face and ear-coverts dingy ash-colour with a very faint olive tinge; under surface of the body pale yellowish, creamy white on the chin and upper throat, abdomen, thighs, and under tail-coverts; the feathers of the breast and fore neck with mostly concealed greyish bases, imparting a somewhat mottled appearance; lower flanks mesially streaked with dark brown; under wing-coverts yellowish white, as also the edge of the wing; quills dark brown below, whitish along the edge of the inner web.

Total length 5·7 inches, culmen 0·55, wing 3·9, tail 2·45, tarsus 0·55.

The specimen from which the above description is taken was received by Mr. Henry Whitely, of Woolwich, in a large collection sent direct from Malacca along with the usual Malaccan birds. It cannot be the Himalayan species, *I. xanthonotus*, because the latter has the back and rump yellow; and it differs from the Bornean Honey-Guide (*I. archipelagicus*) in wanting the yellow shoulder-spot, grey breast, and flanks of the last-named bird, and in being altogether larger. This latter fact seems to prevent the possibility of its being considered a young bird of *I. archipelagicus*.

I propose the following amended key for the genus *Indicator*:—



G.B.Sowerby lith. Hanhart imp.

NEW MARINE SHELLS.

a. Uropygio et supracaudalibus dorso concoloribus, flavo nec albo marginatis.
  a'. Tectricibus alarum minimis interioribus reliquis concoloribus; plaga cubitali nulla.
    a''. Subtus fere concolores, haud squamati.
      a'''. Pectore cineraceo, fascia mystacali nigricante; rectricibus extimis pure albis brunneo terminatis.
        *a*⁴. Majores; ala 3·5–3·7 unc.
          *a*⁵. Pallidus: mento summo albicante; tergi alarumque plumis brunneis flavo-olivascenti marginatis *minor*.
          *b*⁵. Saturatior: mento summo nigricante; tergi alarumque plumis nigris aurato-flavo marginatis... *conirostris*.
        *b*⁴. Minor; ala 2·5 unc ..... *exilis*.
      b'''. Pectore olivascenti-flavido; fascia mystacali nulla; genis et regione parotica saturate cineraceis olivaceo vix lavatis; rectrice extima albicanti-brunnea, versus apicem oblique brunnea, reliquis saturate brunneis intus albicanti-brunneis ..... *malayanus*.
    b''. Subtus squamati, haud concolores; gulæ plumis fuscis albo marginatis quasi squamatis.
      c'''. Pectore tantum squamato; abdomine fere concolori albo; hypochondriis albis brunneo striatis ..... *variegatus*.
      d'''. Pectore et abdomine squamatis; hypochondriis brunneis fere concoloribus ..... *maculatus*.
  b'. Tectricibus alarum minimis interioribus læte flavis, plagam conspicuam exhibentibus..... *archipelagicus*.
b. Uropygio et supracaudalibus albicantibus, his albo marginatis.
  c'. Tectricibus alarum minimis interioribus læte flavis, plagam formantibus; hypochondriis brunneo striatis ..... *sparrmani*.
  d'. Plaga cubitali nulla; uropygio pure albo, haud brunneo striato; hypochondriis concoloribus; pileo flavo lavato.
    c''. Regione parotica pallide brunnea; rostro pallide brunneo *major*.
    d''. Regione parotica nigricante; rostro nigro ..... *barianus*.
c. Uropygio et dorso postico flavis ..... *xanthonotus*.

2. Descriptions of ten new Species of Shells. By G. B. Sowerby, Jun.

[Received July 18, 1878.]

(Plate XLVIII.)

Conus melvilli, n. sp. (Plate XLVIII. fig. 1.)

C. *testa abbreviato-subcylindracea, solida, obtuse angulata, lævi, antice crenulato-sulcata, griseo-albida, cinnamomeo-fusco longitudinaliter strigata, lineis fuscis undulatis transverse cincta; interstitiis lineis curvatis longitudinalibus hic-illic irregulariter divisis; spira obtusa, fusco-strigata; anfractibus 7, convexis, lævibus; apertura modica, fauce castanea.*

Long. 20, maj. lat. 11 mill.

Hab. Key West (*J. Cosmo Melvill*).

A small obtuse Cone, with characteristic markings, somewhat resembling those of *C. lucidus* (Mawe), on a smaller scale; the transverse brown lines are more numerous, and the short longitudinal ones crossing the interstices less so. The light-brown streaks almost

cover the shell, leaving small white patches between the transverse lines.

The shell described was picked up on the beach by Mr. Melvill at Key West (south of Florida) in 1872, and is at present the only specimen known of the species.

LATIRUS CAYOHUESONICUS, n. sp. (Pl. XLVIII. fig. 4.)

L. *testa elongato-turrita, solidula, atro-fusca, antice contracta, subelongata; spira elongata; anfractibus* 9, *convexiusculis, spiraliter liratis, longitudinaliter costatis, costis latis rotundatis, liris alternis minoribus, interstitiis striatim cancellatis; apertura ovata, parva, fauce lævi, purpureo-fusca; columella bicostata; canali subelongato, recto.*

Long. 16, maj. lat. 5½ mill.

Hab. Key West (*J. Cosmo Melvill*).

A very dark little *Latirus*, almost black within and without, with general characters common to the genus, and of the ordinary form of the larger species, such as *L. infundibulum*.

Among the shells found by Mr. Melvill at Key West, and submitted to me, the two above described are all that I can consider new species; but the following are worth mentioning:—

Conus japonicus (Hwass), which is identical with *C. largillierti* (Kiener) of Reeve's Conch. Icon. Suppl. pl. 2, species 275. It is a question whether this species, which in all probability never inhabited Japan, should retain the name given by Hwass, or whether that of Kiener should be adopted.

Conus nebulosus: a young specimen with a very sharp elevated spire.

Hemifusus corona (Gmel.). A number of specimens of a very small variety of this species, adult and well developed, but ranging from an inch to an inch and a half in length (Plate XLVIII. fig. 13).

From the collection of the late Sir E. Belcher:—

CONUS CARNALIS, n. sp. (Plate XLVIII. fig. 2.)

C. *testa oblonga, subpyriformi, solida, obtuse angulata, obsolete striata, antice leviter costata; pallide carnea, late pallide fuscescenti bifasciata; spira obtuse-exserta; anfractibus* 9, *lævibus, in medio depressis; apertura modica, carneo tincta.*

Long. 50, maj. lat. 25 mill.

Hab.?

A very pale pink, smooth shell, very faintly banded with buff, of the form of *C. scabriusculus*.

A single specimen from the collection of the late Sir E. Belcher, without any note of locality.

CONUS CATENATUS, n. sp. (Plate XLVIII. fig. 3.)

C. *testa subfusiformi, subtiliter granoso-lirata, postice acute angulata, antice attenuata, medio leviter contracta; albida, fusco irregulariter grandimaculata, liris transversis fusco eximie arti-*

culatis; spira elata, conica, gradata; anfractibus 11, *lævibus, leviter coronatis; apice acuto, fusco; apertura angusta, fusco tincta.*

Long. 31, maj. lat. 14 mill.; spira alt. 10 mill.

A very neatly marked Cone, allied to *C. mahogani*, *C. ximines*, and *C. tornatus*, but perfectly distinct, both in form and markings.

Hab. Panama? (*ex coll. Sir E. Belcher*).

MITRA BERTHÆ, n. sp. (Plate XLVIII. fig. 11.)

M. *testa angulato-fusiformi, solidiuscula, cinerea, longitudinaliter striata et valide plicata, transversim leviter sulcata, antice attenuata, recurva, transversim valide costata; spira acuminato-turrita; anfractibus* 10, *superne angulatis, ad angulum bicarinatis, supra angulum concavis, in medio balteolis nigris duobus cingulatis, linea unica fusca superne circumcinctis; apice nigro-fusco; apertura elongata, intus fusco cincta; columella quadriplicata, plicis duplicatis; labio externo leviter sinuato, lævi, crassiusculo.*

Long. 32, maj. lat. 13 mill., spira alt. 13 mill.

Hab. China Sea (*Sir E. Belcher*).

Several specimens of this pretty shell were found in the above collection, and seem to have been hitherto unnoticed, although the species is very distinct and easily distinguishable from its congeners.

MITRA FULVOLIRATA, n. sp. (Plate XLVIII. figs. 9, 10.)

M. *testa fusiformi, solidiuscula, cinerea, fusco-purpureo late fasciata, fulvo tincta, utrinque fuscata, antice contracta, leviter recurva; spira acuminato-turrita; anfractibus* 10, *convexiusculis, superne obtuse angulatis, transversim leviter sulcatis, longitudinaliter costatis, costis subangulatis, obtusis, fulvescentibus; apertura elongata, fauce lævi, fusco-purpurea; columella quadriplicata, plicis obtusis, quadratis; labio externo simplici.*

Long. 27, maj. lat. 9 mill., spira alt. 12 mill.

Hab. China Sea (*Sir E. Belcher*).

Several specimens presenting scarcely any variation were found in the above collection. Although a species of no very striking character, I cannot identify it with any hitherto described.

MITRA ACUTA, n. sp. (Plate XLVIII. figs. 7, 8.)

M. *testa angulato-fusiformi, albida, interdum purpureo tincta, fusco punctata, castaneo unifasciata, vel flammulata; spira acutissima; anfractibus* 10, *transversim carinatis; carinis numerosis, elevatis, acutissimis; interstitiis concavis, interdum lævibus, plerumque cancellatis; apertura subangusta, intus alba, lævi; columella quinqueplicata, plicis acutis; labio externo vix arcuato, crenulato.*

Long. 20–23, maj. lat. 8–9 mill.

Hab. China Sea (*Sir E. Belcher*).

A number of specimens of this species were found in the above collection. They vary considerably in sculpture, some being smooth

between the keels, and others cancellated; but they all agree in being much more sharply angular than the specimens of *M. annulata* from Ceylon and Mauritius, the keels being more acute and prominent, and the body-whorl being shorter in proportion to the spire.

From other sources :—

MITRA DEBURGHIÆ, n. sp. (Plate XLVIII. fig. 12.)

M. *testa cylindraceo-conica, solidula, cinerea, hic illic sparsim fusco punctata, maculis albidis distantibus triseriatim dispositis cingulata, postice albida, ubique transversim sulcata, sulcis profundis, valide cancellatis; spira brevissima, conica, albida; anfractibus* 9, *obtuse angulatis; apice fusco; apertura oblonga, antice subexpansa, fauce cinereo-fusca; columella quinqueplicata, plicis acutis, labio externo serrato.*

Long. 16, maj. lat. 8 mill.

Hab. Tahiti.

A very pretty and distinct species of the *Imbricaria* section.

MITRA PUNCTURATA, n. sp. (Plate XLVIII. fig. 5.)

M. *testa angusta, solida, antice leviter contracta, carneola, rufo-fusco maculata et flammulata, ubique longitudinaliter costata; costis numerosis, subconfertis, planulatis, interstitiis profunde punctatis; spira elongata; anfractibus* 9, *planato-convexis; sutura impressa; apertura oblonga, intus costata, carneola; columella* 5-*plicata.*

Long. 20, maj. lat. 5, spira alt. 10 mill.

A single specimen without locality, but very strikingly different from every known species.

ZIZIPHINUS JUCUNDUS, n. sp. (Plate XLVIII. fig. 6.)

Z. *testa acute sublate conica, tenui, fulvo-carneola, lineis fuscis minutis confertis interruptis spiraliter cingulata, versus apicem cinereo-fasciata; anfractibus* 10, *vix convexis, primis grano-liratis, sequentibus lævibus, ultimo juxta suturam iterum subconspicue grano-lirato, liris deinde fere obsoletis; sutura impressa; marginibus obtuse carinatis, maculis rubidis subdistantibus ornatis; basi planato-convexa; apertura oblique quadrata, fauce margaritacea; columella callosa, obliqua, vix intorta.*

Alt. 30, maj. diam. 33 mill.

Hab. Japan.

A very neatly formed and delicately marked shell, of which only one specimen is at present known.

EXPLANATION OF PLATE XLVIII.

Fig. 1. *Conus melvilli*, p. 795.
2. —— *carnalis*, p. 796.
3. —— *catenatus*, p. 796.
4. *Latirus cayohuesonicus*, p. 796.
5. *Mitra puncturata*, p. 798.
6. *Ziziphinus jucundus*, p. 798.
Figs. 7, 8. *Mitra acuta*, p. 797.
9, 10. —— *fulvolirata*, p. 797.
11. —— *berthæ*, p. 797.
12. —— *deburghiæ*, p. 798.
13. *Hemifusus corona*, var. *minor*, p. 796.

3. Description of a Remarkable new Spider from Madagascar. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Received July 24, 1878.]

Amongst a series of insects of various orders recently collected in Madagascar by the Rev. William Deans Cowan, I found two Epeirids which especially interested me. The first of these I at once recognized as a fine example of the *Epeira tuberculosa* of Vinson (Aran. de Réunion, Maurice, et Madagascar, pl. xiv. fig. 2), specimens of which were previously in the collection of the British Museum.

The second spider struck me as so extraordinary that I wrote to the Rev. O. P. Cambridge respecting it. He tells me that it is a *Cœrostris*, allied to *C. mitralis*, Vinson (*loc. cit.* pl. ix. figs. 2–4), but it appears to be perfectly distinct. "*Epeira tuberculosa*" belongs also to *Cœrostris*.

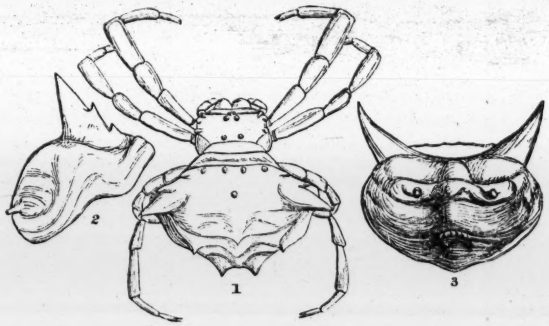


Fig. 1. *Cœrostris avernalis* (enlarged). Fig. 2. Profile of abdomen.
Fig. 3. View of abdomen from behind.

Cœrostris avernalis, n. sp.

Cephalothorax and falces dark castaneous, clothed at the sides and behind with whity-brown pile; palpi and legs above bright reddish castaneous, hairy at the sides, the femora cylindrical, with blackish lateral hairs, the tibiæ and tarsi flattened and longitudinally bisulcate, with whitish lateral hairs; tibiæ and tarsi below with their basal or distal extremities broadly belted with whitish, and their proximal extremities blackish; abdomen dark clay-coloured, covered (excepting the tubercles and odontoid processes) with whitish pile; centre of ventral surface blackish.

Falces large, rugulose, subcylindrical; palpi broad, flattened, bi-

sulcated, hairy at the sides; cephalothorax broader than long, with a small central projection in front, so that its anterior margin is ⌣⌣-shaped; a broad gradually formed transverse ridge almost uniting the three oculiferous tubercles; the central oculiferous tubercle forming a transverse oval, with a central longitudinal depression, its highest point just within the eyes, and the uppermost surface of the eyes themselves flattened (as if filed smooth), the anterior pair of eyes much nearer to each other than the posterior pair; lateral oculiferous tubercles standing out obliquely from the antero-lateral angles of the cephalothorax, the eyes much smaller than those of the central group; a long cylindrical process emitted from each side of the cephalothorax at its postero-lateral angles and parallel to the lateral oculiferous tubercles; two widely separated conical tubercles standing perpendicularly upon the posterior border of the cephalothorax: abdomen irregularly subscutiform, with two terminal tubercles, between which it is sinuated; anterior margin with six conical tubercles, followed by a large unequally bidentate process on each side, these processes being widely divergent and oblique; a very minute tubercle on a bare spot between them; second superior abdominal fold with an acute conical tubercle on each side; pectoral shield heptagonal, its margins swollen.

Length 16 millims., including cephalothorax, of abdomen alone 12, width at widest part 15; length of lateral odontoid processes 6, width from tip to tip of processes 15; relative length of legs 1, 2, 4, 3.

Fianarantsoa, Madagascar. Type in Coll. B. M.

Readily distingnished from *C. mitralis* by the much more prominent, more unequally bidentate, and far more divergent odontoid processes on the abdomen, the almost entire absence of the large central conical tubercle, the different arrangement of the tubercles on the margins of the abdomen, and the absence of bands on the upper surface of the legs.

4. Description of six new Species of Snakes of the Genus *Silybura*, Family *Uropeltidæ*, from the Peninsula of India. By Lieut.-Colonel R. H. Beddome, C.M.Z.S.

[Received August 2, 1878.]

Silybura.

Sect. 1. *Scales in nineteen rows.*

* *Caudal disk flat.*

Silybura broughami, n. sp.

Scales in 19 rows round middle of body, and neck; ventrals 224. Rostral large, high and sharp, nearly but not quite separating the nasals. Caudal disk flat, the scales prominently 3–5-keeled; terminal scute slightly bicuspid, the points side by side. Subcaudals 6. Colour brown, with a series of transverse wavy black blotches

in which are often ocellated white spots; sides with yellow blotches: abdominals dark brown.

Hab. Sirumullay hills (Madura district), 5500 feet elevation.

SILYBURA LEVINGII, n. sp.

Scales in 19 rows round body, ventrals 196. Rostral sharply pointed; nasals not quite separated by the rostral. Caudal disk very flat, the scales prominently 3–10-keeled; subcaudals 8–9. Upper parts purplish-brown, with narrow transverse black bands, in which are arranged yellowish white spots; sides with large yellow blotches; belly purplish brown, the blotches of the sides sometimes extending more or less across, particularly in the posterior portion. Tail with several yellow blotches on each side.

This species has much the coloration of *S. melanogaster*.

Hab. Lower Pulney hills (Madura district), 4000 feet elevation.

Sect. 2. *Scales in seventeen rows.*

A. *Number of scutes exceeding* 160.

b. *Caudal disk convex.*

SILYBURA OCHRACEA, n. sp.

Scales in 17 rows (neck and body), ventrals 225–231, rarely only 214. Rostral obtusely conical, moderate; nasals forming a suture behind the rostral; caudal distinct, more or less convex, the scales 3–8-keeled. Terminal scute much broader than long, ending in two points side by side; anal bifid; subcaudals 6–8–10. Back yellowish green in life (yellowish-brown in spirits), in the young and half-grown purplish brown, with irregular cross bands of ocellated spots, which are yellow with a black ring; sides and belly yellow, but the latter much marbled and blotched irregularly with the ground-colour; tail black beneath, surrounded with a bright yellow band; tail and head blackish olive. Length of a full-grown specimen 20 inches.

Hab. Anamullays, at Nelliamputty, 3000 feet, and at Ponachi, 4500 feet, and on the Bolumputty hills, 2000 feet.

SILYBURA DUPENI, n. sp.

Scales in 17 rows (19 round neck); ventrals 233. Snout obtuse; nasals not separated by the rostral; caudal disk more or less convex, the scales rough, with 3–7 keels; terminal scute very sharply bicuspid and very rugose, the points side by side; subcaudals 10. Back uniform brown; belly and sides (2–3 outer rows of scales) yellow.

Hab. Anamullays at Nelliamputty, 3000 feet.

This may be only a variety of the last; but it has quite a different coloration.

SILYBURA GUENTHERI, n. sp.

Scales in 17 rows, ventrals 168. Rostral obtuse; nasals entirely separated by the rostral; no supraorbital; caudal disk convex; tail laterally compressed (as in *Plectrurus*); the scales perfectly smooth;

the terminal scute hard, yellow, and almost square at the end, the inconspicuous points being side by side, not superposed; subcaudals 13. Back uniform black nacreous, belly with two rows of the scales on each side of the ventrals yellow; chin and the anterior first inch or so of the belly black; tail black beneath, but with a yellow band on each side; upper labials yellow.

Hab. "High Wavy" mountain, Madura district, 5000 feet elevation.

B. *Number of scutes less than* 160.

a. *Caudal disk flat; snout obtuse.*

SILYBURA MADURENSIS, n. sp.

Scales in 17 rows, abdominals 142–149. Rostral very small, obtusely conical; nasals large, forming a suture behind the rostral; vertical distinctly six-sided; caudal disk flat, each scale with 1–2 very prominent keels; terminal scute sharply bicuspid, the points side by side; subcaudals 7–8. Back black, very iridescent, each scale girt with a narrow white rim; belly orange-yellow, with very irregular broad black markings, which sometimes meet and form cross bars.

Hab. "High Wavy" mountain, Madura district, elevation 5500 feet.

5. A Note on *Pœoptera lugubris*, Bp.

By R. BOWDLER SHARPE, F.L.S., F.Z.S.

[Received August 15, 1878.]

(Plate XLIX.)

This species was first described by Prince Bonaparte, in the 'Comptes Rendus' for 1854, as *Pœoptera lugubris*, as he thought it was the Abyssinian *Muscicapa lugubris* of Müller (Beitr. Orn. Afr. Taf. ii.); and it was on account of this confusion of names that Dr. Brüggemann wrote his note in the 'Annals of Natural History' for 1877 (xx. p. 244), and suggested that the species should be called *Pœoptera cryptopyrrha* (Cabanis). When he states, however, that the species had no name of its own until 1876, he is mistaken; for the title "*lugubris*, Bonap." was adopted for the species by Dr. Hartlaub (Orn. Westafr. p. 69), which was sufficient to fix the specific name. But on reading Bonaparte's description again, I find that I missed the point of it, and Dr. Brüggemann does not appear to have consulted the original description, having been incited to write his notice probably by the footnote to the genus *Pœoptera* in my 'Catalogue,' wherein I hinted that Bonaparte had so confused his species with Müller's *Muscicapa lugubris* that the title ought perhaps to be rejected. I am sorry to have led Dr. Brüggemann wrong, for I had overlooked the fact that when Bonaparte described the *Pœoptera* he added:—"Nous appellerons l'espèce *lugubris*, qu'elle



4/5

J.G.Keulemans lith. Hanhart imp

PŒOPTERA LUGUBRIS.

soit ou non la *lugubris*, Müller;" and I am glad that I followed Hartlaub, and did not alter the name, as I had felt inclined to do. Dr. Brüggemann was also mistaken in supposing that he was the first to inform me of the probable identity of the species described by Cabanis with Bonaparte's *Pœoptera lugubris*; for I had finished my synonymy of this bird for my 'Catalogue' long before the casual conversation to which he alludes.

After all, however, it appears that both Dr. Brüggemann and myself were wrong in our facts, and *Myiopsar cryptopyrrhus* of Cabanis is *not* synonymous with *Pœoptera lugubris* of Bonaparte. Dr. Peters having very kindly sent me from Berlin some of the new species of birds lately described by Drs. Cabanis and Reichenow for examination, has added the type of *Myiopsar*, and asked me to compare it with our examples of *Pœoptera lugubris*. I am surprised to find it specifically distinct; and so the subjoined modification must take place in the synonymy of the genus as given by me in the 'Catalogue.'

Genus Pœoptera.

Pœoptera, Bp. Comptes Rendus, xxxviii. p. 381 (1854) ..... Type. *P. lugubris*.

Myiopsar, Cabanis, J. f. O. 1876, p. 93 ..... *P. cryptopyrrha*.

Range. West Africa, from the Gold Coast to the Congo.

Key to the Species.

a. Purple; edges of secondaries whity brown, forming a light band down the wing; inner webs of quills dark brown, scarcely lighter than the outer web. ..... *P. lugubris*.

b. Violet-blue with somewhat of a greenish gloss; no whity-brown edges to the wing; quills rufous on the inner web, forming a red lining to the wing ..... *P. cryptopyrrha*.

1. Pœoptera lugubris. (Plate XLIX.)

Pœoptera lugubris, Bp. C. R. xxxviii. p. 381; Hartl. Orn. W.-Afr. p. 69 (1857); Sharpe, Cat. B. iii. p. 281 (1877).

Thamnobia lugubris, Gray, Hand-l. B. i. p. 212 (1869).

Pœoptera crptopyrrha, Brügg. Ann. N. H. (4) xx. p. 244 (1877, nec Cabanis).

Hab. From the Gold Coast to Gaboon.

Since the publication of the Catalogue, I have discovered in the British Museum a third specimen, a male, put away by mistake along with the species of *Thamnobia*, according to Gray's classification. It was only discovered this month (August 1878), during a re-arrangement of the specimens of Chats.

2. Pœoptera cryptopyrrha.

Myiopsar cryptopyrrhus, Cab. J. f. O. 1876, p. 93.

Adult male (type of species).—General colour above glossy violet blue, with here and there a slight shade of steel-green; least

and median wing-coverts like the back, the remainder, as well as the quills, dark brown, with slightly paler edges; the primaries rufous for the greater portion of their length, this red colour concealed when the wing is shut; tail-feathers black, edged with dull violet-blue; sides of face and entire under surface of body glossy violet-blue, a little duller than the upper surface; under wing-coverts like the breast; quills dusky brown below, the inner webs broadly rufous for a great portion of their extent. Total length 7·5 inches, culmen 0·6, wing 3·5, tail 3·3, tarsus 0·75. (*Mus. Berol.*)

Hab. Congo district.

6. On a Collection of Marine Shells from the Andaman Islands. By Edgar A. Smith, F.Z.S., Zoological Department, British Museum.

[Received August 16, 1878.]

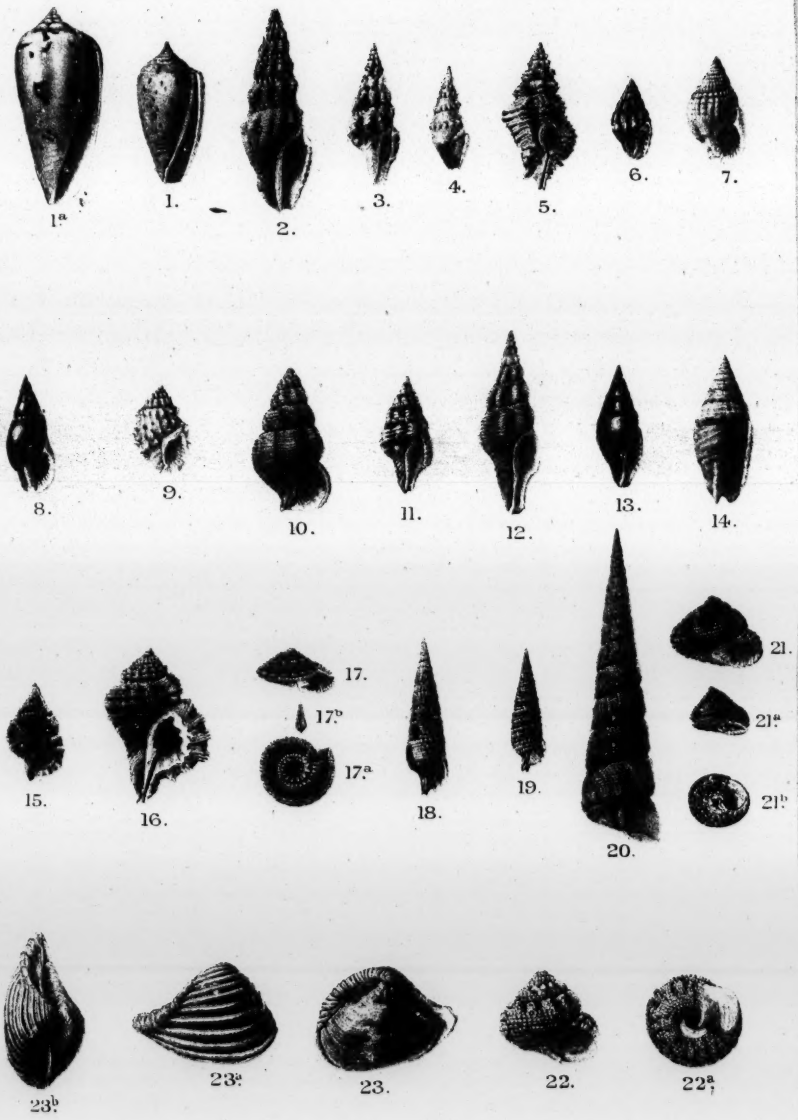
(Plate L.)

The shells treated upon in this paper form part of a series recently presented to the British Museum by Capt. L. Worthington Wilmer, by whom they were dredged whilst stationed at the Andaman Islands. All, with one or two exceptions, were obtained at the depth of a few fathoms off Port Blair. The collection contains about half a dozen new forms, the most interesting of which is a remarkable shell which I have provisionally located in the genus *Fusus*. After each species I have quoted the locality first assigned to it, and others have been added on the authority of specimens in the Museum, in order to give at a glance the known geographical distribution, which is always interesting, and calculated to assist materially in the identification of the various forms.

1. Conus andamanensis. (Plate L. figs. 1, 1 *a*.)

Shell subcylindrical, with somewhat convex lateral outlines, pale pinkish white, marked irregularly with small brown spots and lines, and covered with a very thin, smooth, greyish epidermis: spire elevated concave, composed of ten whorls; the two nuclear ones subglobose, semidiaphanous, smooth, the four following slightly turreted, and the rest obliquely planulated, spirally sculptured with two to three fine revolving striæ; the markings on the spire are in the form of short brown lines following a radiating direction (that is, across the whorls): the last whorl has the upper angle rather obtuse, and is sulcated at the base with about twelve transverse grooves. Aperture rather narrowed above, and a little widened towards the base, white within. Lip thin, with a small sinuation at the upper extremity. Length 22 mill., diam. 11.

This pretty little species, which I am unable to place as the young state of any larger form, is remarkable on account of the fine brown dots or lines, which are irregularly scattered over its surface of a



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delicate pale pink. The spire too is peculiar, on account of the few first whorls being suddenly elevated into a little prominent cone.

Since writing the above description I have seen a larger specimen from the collection of Dr. Hungerford. It measures 31 millims. in length and 15 in diameter; and the markings are rather larger, certain spots a little above the middle of the last whorl taking the form of a transverse interrupted band (fig. 1 *a*).

2. Conus ceylanensis, Hwass.

Hab. Red Sea, Ceylon, Rodriguez Island; varieties at Sandwich Islands, Lord Hood's Island, &c.

3. Pleurotoma (Drillia) variabilis, Smith, Annals & Mag. Nat. Hist. 1877, vol. xix. p. 495. (Plate L. figs. 2 & 3.)

There is a non-adult variety of this species, which does not exhibit at this stage of growth any indication of the slight umbilical rimation which is characteristic of the mature shell. It is whitish dotted with brown beneath the suture, and stained with a darker tint above it in the spaces between the short costæ; and the spiral liræ are also dotted with brown. The body-whorl is encircled around the middle by a broad brownish band, which is darker at the edges, and below this it is entirely white.

4. Pleurotoma (Drillia) wilmeri. (Plate L. fig. 4.)

Shell subfusiform, not rimate, white, dotted with brown beneath the sutural line, and with a series of brown dots or (in other words) an interrupted line around the middle, the dots being situated just above the interspaces between the nodules, which form a series a little below the middle of the whorls. The lower half of the body-whorl dark brown; and a spot of the same colour stains the shell at the superior sinus; the apex is also brown. Whorls ten, broadly concave above, and somewhat acutely noduled below; nodules eleven in number on the penultimate whorl, the last volution transversely striated, the basal striæ being stronger than elsewhere; aperture rather small, white, stained with dark brown at the short basal canal; labrum thin, arcuate when viewed laterally, deeply and broadly sinuated at the suture, with a second small sinus or indentation near the base; columella but little curved or sinuous, covered with a thin brown callosity, terminating above in a large white tubercle. Length 16 mill., diam. 6.

This shell is very distinguishable from its congeners, on account of the peculiarity of its painting, and the series of sharpish tubercles encircling the whorls. I have much pleasure in naming it after Capt. Wilmer, its discoverer.

5. Terebra affinis, Gray.

Hab. Philippines, Fiji, Tahiti.

6. Terebra exigua, Deshayes.

Hab. East Australia.

It is interesting to obtain authentic examples of this species from

the Andaman Islands, as the type shells were described as East-Australian. The specimen before me, which is apparently adult, has a length of 21 millims., and the last whorl is 4 in diameter. The costæ (about 18 on a whorl) are thickest at the upper extremity, above the sulcus which parts off the infrasutural belt, gradually attenuating downwards, and at length become quite obsolete at the extreme base of the body-whorl.

7. Murex (Muricidea) cirrosus, Hinds.

Hab. Straits of Macassar (*Hinds*).

Some small specimens of this charming shell were dredged by Capt. Wilmer, one of which possesses an unusually long canal.

8. Murex (Muricidea) rusticus, Reeve. (Plate L. fig. 5.)

Hab. ——?

I feel uncertain whether the Andamanese shell is without doubt the same species as that figured by Reeve. It agrees very well with the description, but exhibits some difference from the figure, which is very coarsely executed. The number of transverse ridges is greater, the mouth a little smaller; and the fronds, although a little broken and worn, would not I think, if perfect, be as long as those represented in the figure.

9. Murex (Muricidea) barclayana, H. Adams.

Coralliophila barclayana, H. Ad. P. Z. S. 1873, p. 205, pl. 23. fig. 1.

Hab. Mauritius (*H. Ad.*).

The Andamanese specimen of this species, the type of which is now in the British Museum, is only 21 millims. in length, yet apparently full-grown. Its coloration is much less brilliant than the representation of the described shell, being pale pinkish white, with the lateral varix and the termination of the canal tinged with brown, the aperture being light purple.

10. Murex (Ocinebra) breviculus, Sowerby, Proc. Zool. Soc. 1840, p. 146; Conchol. Illustr. fig. 37.

M. tetragonus, Reeve (non Broderip), Conch. Icon. iii. fig. 118.

Hab. ——?

A single, much worn, yet undoubted example of this species is valuable as indicating the habitat of so interesting a form. Reeve considers it a short variety of Broderip's *M. tetragonus*, the figure he gives of the latter representing a typical *breviculus*. *M. tetragonus* proper is well figured by Sowerby in his 'Conchological Illustrations,' fig. 25. Judging from the specimens of the two species which I have examined, all of them unfortunately in a more or less worn and faded condition, I am of opinion that they are specifically distinct. Besides the much stouter and less-produced form of *M. breviculus*, its aperture is larger and more circular, white or slightly blotched with brown far within; the transverse costæ, especially on the obtuse varices, are also brown. *M. tetragonus*, on the other

hand, is white, or very pale purple, and the aperture, the interior of the basal channel, and the columella, are of a uniform light purple. It is true, however, that the sculpture in both is remarkably similar.

11. Columbella (Anachis) nigricostata. (Plate L. fig. 6.)

Shell acuminately ovate, subturreted; beneath a thin dirty yellowish epidermis, white, with black ribs, with a series of white spots on the costæ a little above the middle of the last whorl, and with a black elongate spot or line in each of the interstices between the ribs, those towards the labrum being produced downwards to the base in a rather zigzag manner. Whorls 8, a little convex, with about 12 thinnish ribs on each. Body-whorl a little flattened or even concave at its broadest part; the ribs in front are produced somewhat below the middle; and on the back four or five nearest the lip are developed only a short distance from the suture, leaving the whorl below them smooth. At the base it is transversely grooved, the eight or nine ridges or liræ between the sulci being spotted with black. These spots are the continuation of the colouring of the longitudinal costæ. Aperture small, narrow, bluish white within; labrum exteriorly thickened, thin at the edge and bearing about 8 tubercles within, of which the three or four upper ones are the largest; columella suberect, slightly convex at the middle, covered with a thin callosity, with a free margin, through which the transverse ridges which wind round the end or cauda of the whorl appear somewhat in the form of nodules. Length 12½ mill., diam. 6.

This species is well characterized by its coloration, the black costæ contrasting conspicuously with the pale interstices. It is considerably like *C. terpsichore*, Sowerby, in form and sculpture, but different in colour.

12. Columbella (Atilia) puella, Sowerby; Reeve, Conch. Icon. xi. sp. 65.

Hab. Philippines.

The plicæ on the back of the body-whorl are almost obsolete; but immediately behind the labrum three are well developed and situated very close together, thus forming a very strong postlabral varix. The denticulation within the aperture consists of about eight short fine liræ. The columella is coated with a thickish enamel, and is armed with about seven fine, short, transverse lirations.

13. Engina astricta, Reeve.

Ricinula astricta, Reeve, Conch. Icon. iii. fig. 31.

Hab. ——? (*Rve*).

14. Nassa elegans, Kiener; Reeve, Conch. Icon. viii. pl. 2. fig. 10 (not good); Kiener, Coq. Viv. pl. 24. fig. 97.

Hab. Indian Ocean.

15. Nassa crenulata, Bruguière; Reeve, Conch. Icon. sp. 2; Kiener, Coq. Viv. pl. 23. fig. 90.

Hab. Philippines.

16. Nassa tænia, Gmelin, Syst. Nat. p. 3493; Knorr, Vergnüg. v. pl. 10. fig. 3.

N. olivacea, Bruguière, Reeve, fig. 19; Kiener, pl. 15. fig. 53.

Hab. "West Indies" (*Lamarck and Reeve*); Ceylon and Chili (*Kiener*).

"West Indies," which is cited by some authors as the home of this species, is doubtless erroneous; for it is scarcely possible that any species of Mollusca living on the shore between tide-marks could be found inhabiting such remote localities as the Andaman Islands and the West Indies. It was collected by Cuming on mud banks in the Bay of Manilla; and the specimens obtained by Capt. Wilmer were found on the mud in mangrove-swamps.

17. Nassa lurida, Gould, Proc. Boston Soc. Nat. Hist. 1849, vol. iii. p. 153; Atlas, Wilkes's Explor. Exped. pl. 19. fig. 325 *a*, *c*; Otia, p. 68.

N. dispar, A. Adams, P. Z. S. 1851, p. 96; Reeve, Conch. Ic. fig. 45.

Hab. Samoa Islands (*Gould*); Philippines (*Reeve*).

18. Nassa bifaria, Baird, Cruise of the Curaçoa, p. 436, pl. 38. figs. 1, 2. (Plate L. fig. 7.)

Hab. New Caledonia

The type of this species was brought from New Caledonia. The Andaman specimens differ from that form in a few respects: the plicæ on the body-whorl are more numerous and more developed towards the base; and the transverse sulci on the central portion are generally more pronounced.

19. Nassa monile, Kiener, Coq. Viv. pl. 11. fig. 40; Reeve, Conch. Ic. fig. 38.

Hab. Philippines.

20. Nassa margaritifera, Dunker.

Buccinum margaritiferum, Dkr., Philippi's Abbild. vol. iii. pl. 1. fig. 12. (Non *Nassa margaritifera*, Dkr., Reeve, figs. 59 *a*, *b*.)

N. costellifera, A. Adams, P. Z. S. 1851, p. 113; Reeve, figs. 58 *a*, *b*.

Hab. Rocks below Ross Island; Port Blair (*Wilmer*).

The shell figured by Reeve as *margaritifera* of Dunker certainly is distinct from that species, and may possibly be a closely ribbed variety of *Nassa mvrginulata*, Lamarck.

21. Nassa stigmaria, A. Adams, P. Z. S. 1851, p. 96; Reeve, Conch. Icon. sp. 42.

Hab. "Dredged in deep water, Port Blair" (*Wilmer*). Other localities are Japan, Philippines, and New Caledonia.

The specimens from the Andaman Islands are very much smaller than that figured by Reeve, having only a length of 10 to 13 millims. In all other respects they agree very well, varying one from another

in the length of the spire, the proximity of the series of granules, and the size of them.

A peculiarity of this species consists in the manner in which some of the yellowish tubercules are as it were set in an irregular darker-coloured ring, or, in other words, are surrounded by a dark line at their base.

22. Nassa gemmulifera, A. Adams, P. Z. S. 1851, p. 99; Reeve, Conch. Icon. viii. figs. 132 *a*, *b*.

Hab. Philippines (*Cuming*).

23. Nassa albescens, Dunker.

Buccinum albescens, Philippi's Abbild. neuer Conch. iii. pl. 2. fig. 15.

Nassa albescens, Reeve, Conch. Icon. viii. fig. 100.

Hab. West Indies (*Dunker and Reeve*); Sandwich Islands.

This species is undoubtedly an East- and not West-Indian species. It has been found at the Sandwich Islands by Pease, and also at other localities in the Pacific.

24. Nassa (Arcularia) globosa, Quoy and Gaimard.

Buccinum globosum, Q. and G. Voy. Astrolabe, pl. 32. figs. 25-27.
Nassa globosa, Reeve, Conch. Icon. viii. figs. 62 *a*, *b*.

Hab. Vanikoro Island and New Ireland (*Quoy*).

25. Nassa marratii, Smith, Journ. Linn. Soc. xii. p. 543, pl. 30. fig. 4. (Plate L. fig. 8.)

Hab. Solomon Islands.

This species I described from specimens collected at the Solomon Islands. The shells from the Andaman Islands are a trifle larger, having a length of 19 millims; with the exception of this difference, they agree perfectly with the typical shells. In the above-quoted figure of this species the form of the aperture is not at all correctly drawn. The columella has not such a long curve; and the labrum should be more expanded at basal end.

26. Nassa (Hima) sistroidea, G. and H. Nevill, Journ. Asiatic Soc. Bengal, 1874, xliii. part 2, pl. 1. fig. 6.

Hab. "Found in one spot below the rocks near the barracks, Ross Island, very local" (*Wilmer*).

In their description of this interesting species, Messrs. Nevill do not remark upon the curious way in which the costæ on the body-whorl are trinodose through the prominence of some of the transverse liræ at intervals. The uppermost row of nodulous projections borders the depression or elevation at the top of the whorl; the median series is situated about the middle, and the lowermost a little below that. This I take to be a specific character, as it is present in all the adult specimens which I have seen, and the above-named figure of their type also exhibits this peculiarity. The whitish band which is seen within the aperture runs between the uppermost and median series of nodules.

Besides the two or three "plaits," which perhaps should rather be termed elongate tubercles, at the base of the columella, there is a small one at the upper part, usually present in most species of *Nassa*.

N. trinodosa of Smith has the same nodulation on the last whorl, but, however, is quite distinct from this species. It differs in colour, has fewer longitudinal costæ, which are less granulous; and the spiral thread-like liræ which cross them are fewer and less prominent.

N. subspinosa of Lamarck is another allied species of much the same form, and having the same character of sculpture; only the nodules are much more prominent and the ribs less numerous.

27. Nassa (Arcularia) granifera, Kiener, Coq. Viv. pl. 27. fig. 111; Reeve, Conch. Ic. viii. fig. 72.

Hab. Philippines (*Reeve*).

28. Nassa (Arcularia) bimaculosa, A. Ad. P. Z. S. 1851, p. 102; Reeve, Conch. Icon. viii. sp. 61.

Hab. Philippines (*Cuming*); "Andaman Islands, on sand banks at low tide; very active animal" (*Wilmer*).

29. Nassa (Arcularia) callospira, A. Ad. P. Z. S. 1851, p. 102; Reeve, Conch. Icon. viii. figs. 66 *a*, *b*; G. and H. Nevill, Journ. Asiatic Soc. Bengal, 1874, vol. xliii. pt. 2, pl. figs. 5, 5 *a*.

Hab. Andaman Islands (*Nevill and Wilmer*); Philippines (*Cuming*).

On comparing an Andaman specimen with the type of the species, I do not hesitate for a moment with regard to its identity.

30. Nassa horrida Dunker.

Buccinum horridum, Dkr., Philippi's Abbild. neuer Conch. iii. pl. 2. fig. 8.

Nassa horrida, Dkr., Reeve, Conch. Icon. viii. figs. 69 *a*, *b*.

N. curta, Gould, Otia, p. 69; Atlas, Wilkes's Explor. Exped. pl. 19. figs. 326 *a*, *b*.

Hab. Samoa Islands (*Gould*).

31. Nassa echinata, A. Adams, P. Z. S. 1851, p. 101; Reeve, Conch. Icon. viii. fig. 131. (Plate L. fig. 9.)

Hab. Philippines.

The Andaman specimens are all shorter than the type, which is figured by Reeve; and not one of them has the fifth or lowermost series of nodules on the body-whorl, which is very closely approximated to the fourth row. In other respects they agree perfectly with the typical shells said to have been found at the Philippine Islands. This species is allied to *N. muricata* of Quoy and Gaimard, yet is perfectly distinct. It differs from that species in being almost quite smooth in the interstices between the nodules, there being only the faintest indication of spiral striæ in some specimens. The aperture, too, is less elongate, and the margin of the basal canal is stained with dark brown. This

is very characteristic, and, although not referred to by Reeve or Adams, is constant in all the specimens which I have seen.

The colour is whitish, with the oblique longitudinal costæ usually pale brown; and the tips of the rather acute nodules are white. *Nassa gruneri*, Dunker, is another closely allied form, yet readily distinguished by its colour and sculpture.

32. Phos senticosum, Linn.

Hab. Philippines.

This beautiful and well-known species varies very considerably in colour, from white with dark transverse bands to uniform rich purple-brown, with some of the spiral thread-like liræ yellow.

33. Phos roseatum, Hinds.

Hab. Philippines, Moluccas, &c.

34. Phos textum, Gmel.

Buccinum blainvillei, Deshayes.
B. cancellatum, Quoy & Gaimard.
Phos cyanostoma, Sowb. (not of A. Ad.), Thes. fig. 46.

Hab. Philippines.

The shell figured by Sowerby as *P. cyanostoma* of A. Adams is a slight variety of *P. textum*, differing in having a somewhat elongated spire and the body-whorl a trifle shorter than usual, and constricted just above the raised ridge which encircles the extreme base or cauda of the whorl. The painting is precisely the same in both forms. The true *cyanostoma* (described in the Proc. Zool. Soc. 1850, p. 155) is very like this variety in form and sculpture, but is distinguished by the margins of the columella and labrum and the tip of the body-whorl being stained with violet.

35. Fusus? abnormis. (Plate L. fig. 10.)

Shell imperforate, oblong, turreted, pale yellowish-brown; whorls 9, very convex, divided by a deep channelled suture, obliquely plicated; plicæ or costæ rounded, swollen, gradually increasing in size from the apex downwards and becoming less prominent, crossed by numerous slender finely-scaled liræ, which are alternately coarser and finer, numbering about 15 on the penultimate and about 40 on the last whorl; aperture small, irregularly pyriform, about one third as long as the entire shell, dirty white within, with the outer lip simple, with 10 fine thread-like liræ, which extend within as far as can be observed, but do not attain quite to the edge of the lip: basal canal short, narrow, oblique, and a little recurved. Length 23 mill., diam. 11½.

This species is totally unique in form and sculpture; and it is with considerable doubt that I have placed it among the species of *Fusus*. It also exhibits some affinity with *Coralliophila*, which genus, as generally accepted, contains a group of species which are usually inhabitants of Madrepores, and are characterized by the white or purplish colour, and the scaly nature of the transverse ridges, and the shortish open channel at the base of the aperture, which is

lirate within. The present species is remarkable for the great convexity of the whorls, and the fineness of the spiral scaly liræ. The aperture also is unusually short in proportion to the whole length; and the liræ within are very fine, and produced as far as the eye can trace inwards.

36. SISTRUM MARGARITICOLA, Bruguière.

Hab. Singapore; Lord Hood's Island; Natal.

37. LATIRUS DECORATUS, A. Adams, P. Z. S. 1854, p. 316; Kuster, Con. Cab. Ad. 2, pl. 25. figs. 12, 13 (as *Turbinella*). (Plate L. fig. 11.)

Hab. New Zealand (*Adams*).

The Andaman variety of this species has the longitudinal costæ much thicker, and consequently fewer in a whorl, than the New-Zealand form; and the colour is a little different. The general tint is whitish with a blush of rose, the two granulous liræ beneath the suture light brown, interstices between the costæ dark brown, the body-whorl with a rose-coloured band bordered on each side by a white liration around the middle, the tip of the canal blackish, the columella and outer lip pinkish, and the apex of the spire pink. The colour of this species ("alba castaneo varie picta") given by Adams does not at all describe the variety of painting. There are two specimens in the Cumingian collection, both pinkish white with a rosy apex and a pinkish aperture; and one, probably the type, has the dark brown tip to the canal. The shell figured in the Conchylien-Cabinet is larger than the type or the Andaman specimens. The former is 18 mill. long, 17 in diameter, and the largest of the latter 20 in length and 8 in width.

38. LATIRUS FASTIGIUM (Reeve). (Plate L. fig. 12.)

Turbinella fastigium, Reeve, Conch. Ic. iv. figs. 72 *a*, *b*.

Hab. Ceylon.

Of this species the British Museum possesses three specimens—one from Ceylon, the type (the habitat of which is unknown), and the third presented by Capt. Wilmer, from the Andaman Islands. Two of them have six longitudinal costæ, whilst the type has only five. The latter is an immature shell; and consequently the figure of it in the 'Conchologia Iconica' does not convey a true idea of the aperture in the adult. When perfect the canal is a little longer and the columella is covered with a callosity, the edge of which is produced, and at the base of the shell forms an umbilical fissure.

Reeve does not mention that one or two of the spiral liræ just beneath the suture are conspicuously scabrous; nor does he point out that 4 or 5 of them around the cauda of the body-whorl are also scabrous and thicker than the rest, which are frequently alternately coarser and finer. The plaits on the columella are somewhat indistinct and about five in number; and the aperture is finely lirated within, the liræ terminating at some distance from the margin of the labrum.

39. Latirus incarnatus (Deshayes), var.

Turbinella incarnatus, Desh., Kiener, Coq. Viv. pl. 18. fig. 3; Reeve, Conch. Icon. iv. fig. 55.

Hab. Philippines; Australia.

The shell from the Andaman Islands, which I consider a variety of this species, is light brown and darker between the ribs; the apex of the spire is pinkish; and the body-whorl has two spiral whitish or yellowish liræ, one above and the other below the middle of it, the former being visible on the penultimate and antepenultimate whorls. The aperture and columella are pinkish, the outer lip finely lirate within; and the columella has one or two rather indistinct plicæ at the base.

40. Mitra mœsta, Reeve, Conch. Icon. ii. sp. 323. (Plate L. fig. 13.)

Hab. Philippine Islands.

Shell fusiform, turreted, olive-brown, subrimate. Whorls 10 or 11, shortly tabulated above, but very slightly convex at the sides, spirally grooved with three narrow subequidistant sulci, the uppermost one at the top of the whorls, dividing off a thickened edge to the tabulation, which is channelled; this thickened belt is of a brighter brown colour than the rest of the shell. Last whorl transversely sulcated throughout; sulci about 11 in number; a few of the superior ones, with the exception of the uppermost, more or less obsolete; those below the middle broader and deeper, leaving raised ridges or liræ between them. Aperture narrow, brownish within, a little less in length than half the entire shell; columella furnished with a thickish callosity, with a raised free edge forming in the umbilical region a slight fissure; plaits 4, the uppermost thickest, the others in turn by degrees finer; basal channel and tip of the whorl dark brown. Length 19 mill., diam. 6½.

This species is remarkable on account of the turreted character of the spire. The tabulation of the whorls, however, is narrow and shallowly channelled. The Andaman specimen differs from the type in having the whorls more distinctly turreted; the spiral sulci are not so pronounced; and the colour is somewhat different. In the type (which is a worn shell), the upper part of the whorls is white, whilst in the specimen above described it is light brown.

41. Mitra mariæ, A. Adams, Proc. Zool. Soc. 1851, p. 140. (Plate L. fig. 14.)

Hab. Eastern Seas.

In describing this species Adams writes, "*labro intus sulcato.*" I have carefully examined the type specimens in Cuming's collection and also the Andamese shell, and do not find a trace of sulcation within the labrum of any of them, and therefore conclude that the observation of Mr. Adams was incorrect.

The body-whorl has two broad purplish-brown bands indistinctly separated by a faint light zone occupying the greater part of the whorl. Beneath the suture there is a greyish-white band. The entire surface

is variegated with fine white zigzag lines and small brownish spots, principally on the upper edges of the transverse liræ. The superior margin of the upper purplish-brown band is interrupted by opaque white blotches edged on one side by dark brown. In the Monograph of this genus (Thesaurus Conchyl. iv.) Sowerby cosiders this species a variety of *M. incisa*, Ad. & Reeve. However, I think there are sufficient differences to separate them. The form of the latter is narrower, the whorls proportionally higher, the transverse ridges on the spire flatter, and the spire itself is less acutely conical.

42. Mitra (Cancilla) annulata, Reeve, Conch. Icon. ii. sp. 103.

M. nitens, Kiener, Coq. Viv. pl. 29. fig. 96.

Hab. Zanzibar (*Reeve*).

The plaits on the columella are not invariably five in number, some specimens being furnished with a sixth. The shells from the Andaman Islands have less of the brown markings than appear in Reeve's figure, and in this respect resemble more the specimen delineated by Kiener.

43. Mitra (Cancilla) philippinarum, A. Adams, P. Z. S. 1851, p. 141.

M. flammea, Reeve (not of Quoy & Gaimard), Conch. Icon. ii. fig. 120.

Hab. Philippine Islands.

This species, when in fine condition, has the transverse costæ prettily marked with small, close-set, olive-brownish dots. These are not mentioned by Reeve or Adams, owing to the fact that the specimens in Cuming's collection which they described are somewhat worn or over-cleaned; however, they are traceable when closely searched for.

44. Mitra (Chrysame) tabanula, Lamk., Kiener, Coq. Viv. pl. 9. fig. 27; Voy. Astrolabe, pl. 45 bis, figs. 10–13; Reeve, Conch. Icon. ii. fig. 332.

Hab. Philippines (*Reeve*); Vanikoro (*Quoy*).

The specimen of this species from the Andamans is rather small, and of a uniform deep brown colour. The three plaits on the columella are whitish, the aperture olivaceous; and the outer lip has three or four conspicuous tubercular teeth at a short distance from the upper extremity.

45. Mitra (Cylindra) undulosa, Reeve, Conch. Icon. species 193, fig. 192.

Hab. Philippines (*Cuming*).

A very short stunted variety was obtained by Capt. Wilmer. It has eight plaits on the columella, whereof the uppermost is much thicker than the rest.

46. Mitra (Callithea) acupicta, Reeve, Conch. Icon. fig. 76.

The Andaman shell agrees precisely in form with the type from Zanzibar; but the longitudinal costæ are less numerous.

47. Mitra (Callithea) obeliscus, Reeve, Conch. Icon. ii. fig. 107.

A small specimen, not quite adult, from the Andaman Islands, agrees with those from the Philippines in all respects, but has the second white band below the middle of the body-whorl more conspicuous than usual.

48. Mitra (Costellaria) exasperata, Chemnitz; Reeve, Conch. Icon. fig. 162.

M. torulosa, Lamk., Kiener, Coq. Viv. pl. 25. fig. 77.

Hab. Java; Philippines.

49. Mitra (Costellaria) deshayesii, Reeve, Conch. Icon. fig. 170.

Hab. New Caledonia (*Mus. Cuming*).

Capt. Wilmer tells me that the orange-scarlet markings on this pretty species fade considerably after death. One of the specimens he collected is 25 millims. long. The mouth is purplish black within, with a single white zone; and the lip is white within at the margin.

50. Ranella pusilla, Broderip, P. Z. S. 1832, p. 194; Sowerby, Conchol. Illustr. fig. 1*, fig. 1*a*, var.; Reeve, Conch. Icon. ii. figs. 44 *a*, *b* (both varieties). (Plate L. fig. 15).

Triton laciniatum, Mighels, fide Pease, Amer. Journ. Conch. iv. p. 107.

Var. =*R. rosea*, Reeve, *l. c.* fig. 46.

Var. =*Bursa concinna*, Dkr. P. Z. S. 1862, p. 239.

Hab. Lord Hcod's Island and Philippine Islands; Red Sea.

R. rosea, Reeve, and *concinna*, Dkr., which I consider varieties of this species, are distinguished from the normal form almost solely on account of a difference in colour. If this were tenable, the Andaman shell would constitute a third species; for it certainly varies in this respect either from *R. pusilla*, *concinna*, or *rosea*. The principal colour is reddish brown; the lowermost series of granules on the upper whorls, the fourth and fifth series from the top of the body-whorl, and the second rib from the suture on each varix, on all the whorls, are yellow. The columella is purple, with three or four transverse whitish nodules, and within the outer lip near its edge there are about eight white bead-like granules on a dark-purple ground. The interior of the aperture is purple-brown, with the exterior yellow zone visible.

The normal form of the species described by Broderip is white in every part. In the Museum series of nearly 40 specimens there are various intermediate and connecting gradations between this and the pink form (*rosea*) or the brown variety (*concinna*). In fact, the differences are so subtle, that I feel it impossible to draw a line of distinction any where between these varieties. The difference in specimens apparently adult is very striking. The largest example of

the variety (*rosea*) measures 22 millims. in length, whilst a very small one is only 9 millims. long.

The tuberculation is also subject to considerable variation. The number of the transverse series of granules appears to be very constant, there being invariably three principal rows in the upper whorls, and seven in the body-whorl, but the size and number of the granules differ in various examples; and this difference is not peculiar to each form, but exists in shells belonging to the same variety.

Reeve describes the tubercle-like nodules on the angle of *rosea* as bipartite. This is scarcely correct; for there certainly are two series at this point; and being situated rather closely together, they might be considered single nodules subdivided.

51. TRITON (SIMPULUM) STRANGEI, A. Adams & Angas, P. Z. S. 1864, p. 35. (Plate L. fig. 16.)

Hab. Moreton Bay, East Australia.

The whorls in this species are seven in number, and not four as described by the authors of it. The four apical or nuclear volutions are smooth, convex, and horn-colour; the remaining three are somewhat concave beneath the suture, of a pale brown colour; and the varix on the labrum between the spiral ridge is stained with bright red, and the canal with brown.

The transverse costæ are described by Adams and Angas as being trisulcate. This, however, is not the case; for there are only two sulci, making each of the ridges trilirate, the central liration being most prominent. The costæ are prettily undulated, owing to their being prominent at intervals where they cross the longitudinal subplications; there are two of them round the middle of the penultimate whorl, and the one preceding it, and five on the last. The aperture is white, and the columella furnished with a tubercle at both extremities; the Andaman specimen, besides these, has a few intermediate ones. The labrum is strongly varicose, and has six coarse lirations within.

52. TORINIA PERSPECTIVIUNCULUS, var. (Plate L. figs. 17–17 *b*.)

Hab. Red Sea, Seychelles Islands, Philippines, Pacific Islands, &c.

The Andaman and Seychelles specimens of this widely distributed and very diversely shaped species are very depressed in form, similar to the variety (*planulata*) figured by Hanley in Sowerby's 'Thesaurus Conchyliorum,' vol. iii. pl. 254. fig. 63.

The operculum is very elongate-conical, having a marked resemblance in form to a small *Triphoris*.

53. CYPRÆA GANGRÆNOSA, Solander.

Hab. Zanzibar, Mozambique.

54. LITORINA UNDULATA, Gray, Philippi's Abbild. ii. pl. 5. figs. 17, 18; Reeve, Conch. Icon. figs. 67 *b–d* (? fig. 67*a*).

Hab. North Australia, Philippines, and Society Islands.

55. LITORINA VENTRICOSA, Philippi, Abbild. iii. pl. 6. fig. 19; Reeve, Conch. Icon. fig. 93.

Hab. Pulo Penang.

L. novæ-zealandiæ, Reeve, and *L. melanacme*, Smith, have a somewhat similar ventricose form, but differ in colour and the absence of the granulation on the transverse ridges between the sulci.

56. CERITHIUM (VERTAGUS) KOCHI, Philippi, Abbild. iii. pl. 1. fig. 3; Conch. Icon. figs. 26 *a*, *b*. (Plate L. fig. 18.)

Hab. East Africa, Philippines, Japan.

The Andaman specimens are small, but agree very closely in detail of sculpture with more typical ones, yet differ rather in colour. They are pale horn-colour, with the granules, varices, and a band at the top of the whorls whitish. Behind the varices they are blotched with dark brown; and their entire surface is irregularly dotted and spotted with brown, and the transverse thread-like striæ are also of the same colour; the liration below the middle of the body-whorl, which is more prominent than the rest, is white, ornamented with brown dots.

57. CERITHIUM (VERTAGUS) TURRITUM, Sowerby, Thesaurus, ii. pl. 180. fig. 101; Reeve, Conch. Icon. xv. fig. 58; Smith, Annals & Mag. Nat. Hist. 1875, xvi. p. 106. (Plate L. fig. 19.)

Hab. Philippines, Japan.

The shells in the present collection are in colour and sculpture exactly like those which I described in the Annals and Mag. Nat. Hist., from Japan, but a trifle smaller.

58. TRIPHORIS SCULPTUS, Hinds, Voy. Sulphur, pl. 8. fig. 3.

Hab. Straits of Malacca (*Hinds*).

59. TURRITELLA INFRACONSTRICTA. (Plate L. fig. 20.)

Shell subulate, subturreted, brownish white, ornamented with countless minute reddish-brown dots. Whorls about 20, somewhat convex at the top and sides, and slopingly narrowed at the base, thus making the width at the suture considerably less then a little distance above it, transversely finely lirated; liræ varying in thickness, a few being a trifle coarser than the rest, two especially—the upper, situated very near the middle of the whorl, and the lower one at the broadest part of it, being conspicuous and forming indistinct angles; they are all minutely dotted with brown. Last whorl excavated beneath, finely lirated, and of a uniform brownish white or pale pink tint, with a rather acute ridge circumscribing the base. Aperture irregularly obliquely quadrate, of the same colour as the exterior; but the flattened base is coated with a thin pale rose-coloured enamel. Columella slightly oblique and a little arcuate. Length 50 millims., diam. 12.

This species, like most others in the genus, is chiefly distinguished by the form of the whorl, the character of the markings, and the spiral liration. The dottings on the ridges are very small, and are

arranged under one another in oblique and more or less flexuous lines. In other words, the whorls are ornamented with fine oblique or flexuous lines, which are interrupted by numerous spiral sulci, thus producing series of dots. Through the prominence, although slight, of the two principal liræ, the whorls between them appear somewhat concave, and the ridge around the base of the last whorl passes just above the labrum and winds up the spire at the sutural line.

60. Amalthea australis, Lamarck.

Hab. Kangaroo Island, Australia, Philippines.

61. Gladius (Rimella) cancellatus, Lamarck; Kiener, Coq. Viv. (*Rostellaria*), pl. 3. f. 3.

Hab. "Chili and Moluccas" (*Kiener*).

62. Xenophora solarioides, Reeve.

Phorus solarioides, Reeve, Conch. Icon. i. fig. 8.

Hab. Philippine Islands.

63. Trochus (Clanculus) microdon, A. Adams, P. Z. S. 1851, p. 162. (Plate L. figs. 21–21*b*.)

Hab. ——?

This species, the habitat of which was not hitherto known, is not very fully described by Adams. The colour is subject to considerable variation. The series of granules are usually lightish brown, and the interstices almost black. This simplicity of colour is destroyed by broad, irregular, white patches radiating from the suture; and many of the granules, especially on the base, are white. Two or three of the series of the interstices between them around the umbilicus are white, only a few of the granules being brown. The whorls are six in number and rather convex.

64. Trochus (Monilea) calyculus, Wood, Index Test. Suppl. pl. 6. f. 44; Adams, Gen. Rec. Moll. iii. pl. 49. figs. 3–3*b*.

Trochus (Monilea) masoni, G. & H. Nevill, Journal Asiat. Soc. Bengal, 1874, vol. xliii. part 2, pl. 1. figs. 1, 1*a*.

Hab. Eastern Seas (*A. Adams*, P. Z. S. 1851).

On comparing Andaman specimens of this species with the type presented to the British Museum by the late Dr. Gray, I have not the slightest doubt of their specific identity.

65. Trochus (Forskåhlia) pulcherrimus, A. Adams, Gen. Rec. Moll. i. p. 432. (Plate L. figs. 22, 22*a*.)

Gibbula pulcherrima, A. Ad. P. Z. S. 1854, p. 39.

Hab. China Sea.

The colour of this beautiful species varies in some examples, but appears to be constant in its distribution. The oblique arcuate pink or scarlet stripes on the upper part of the body-whorl, which in some specimens are black, generally terminate a little above the middle. At this part the whorl is encircled by two close-set gra-

nulous liræ, with a furrow on each side, whereof the lower is the more conspicuous. Immediately below this the colour of the interrupted scarlet stripes changes to black, and they assume the form of somewhat quadrate spots, but towards the aperture become more flame-like and merge into scarlet.

66. Haliotis varia, Linné.

H. varia, Linn., teste Reeve, Conch. Icon. iii. sp. 4.

Hab. Philippines.

67. Atys cylindrica, Helbling; Sowerby, Thesaurus, ii. pl. 125. f. 114.

Var. = *Bulla solida*, Brug. Ency. Méth. pl. 360. f. 2; Thesaurus, pl. 124. figs. 112, 113.

Var. = *Atys elongata*, A. Ad.; Sowerby, Thesaurus, ii. pl. 125. fig. 121.

Hab. Philippines, Ceylon.

68. Cardium hystrix, Reeve, Conch. Icon. ii. figs. 40 *a*, *b*.

Hab. Philippines (*Cuming*).

The Andaman specimen of this lovely shell belongs to Reeve's var. β, being pure white, with the exception of a pale tint of pink on the posterior side near the ligament.

69. Cardium (Lævicardium) australe, Sowerby, Proc. Zool. Soc. 1840, p. 105; Conch. Illust. figs. 12, 12* (overcoloured); Reeve, Conch. Icon. ii. fig. 97.

C. pulchrum, Reeve, Conch. Icon. fig. 98.

Hab. Philippines, China, Ceylon.

The differences of form, sculpture, and colouring which Reeve considered sufficient to distinguish his *C. pulchrum* from *C. australe* are, in my opinion, hardly sufficient to constitute a variety. The form in almost every species of *Cardium* is subject to considerable variation, and likewise the colour. Reeve does not mention that the anterior dorsal area in his type is blotched with purple at the extremity, as is the case in *C. australe*. The sculpture of both forms is identical: both have the groove on the posterior side, which, within the valves, forms a raised oblique ridge; but in some specimens it is more conspicuous than in others. The Andaman examples are rather young and bear the remains of their epidermis, which takes the form of very thin, short, irregular yellowish lamellæ arising from the radiating striæ. Their colour is whitish or yellow, marked with subconcentric irregular yellowish brown bands, which are more purple-brown within the valves and towards the umbones. The latter at the tips and the hinge-margin are purple; and within, a line of the same colour extends from the umbo to about the middle of the valves.

70. Corbula fortisulcata. (Plate L. figs. 23–23*b*.)

Shell very inequivalve, inequilateral, somewhat triangular, dirty white, solid, rounded at the posterior extremity and beaked anteriorly:

upper valve slightly carinate from the umbo to the posterior margin, the keel terminating a little above the middle, rather smooth, finely concentrically striated by the lines of growth and sulcated at the umbo; covered with a thin greyish epidermis, a trifle laminated towards the margin; and from the umbo about four rather indistinct ridges radiate down the posterior half of the valve, becoming obsolete about the middle of it, and again conspicuous in some specimens at the margin: lower valve vastly larger than the other, very deeply and widely concentrically sulcated; sulci fine and close together at the umbo; ridges between the sulci very thick and prominent, thicker anteriorly than at the opposite extremity, and terminated in front by a sulcus or depression extending from the umbo downwards at a little distance from the margin, which is raised, taking the form of a stout marginal ridge which terminates the beaked end of the valve; transverse grooves finely striated in the same direction: one tooth in each valve, that of the upper bifurcate; pallial sinus small; anterior scar subrotund, posterior more elongate. Diam. 14 mill., length 10, thickness 8½; the lower valve of another larger specimen is 23½ mill. in diameter and 16 long.

For many years several lower valves of this species have been in the British Museum with the locality "Jack's Island, South Sea," attached to them. Others were presented by J. B. Jukes, Esq., in 1845, who dredged them at Port Essington in 7 fathoms, from a muddy bottom; and two specimens in the Cumingian Collection are from the same place. The form, the coarse costæ (which, however, are sometimes rather close together), and the anterior raised and beaked margin of the lower valve well distinguish the species.

71. CRASSATELLA RADIATA, Sowerby; Reeve, Conch. Icon. i. fig. 12.
Hab. Singapore.

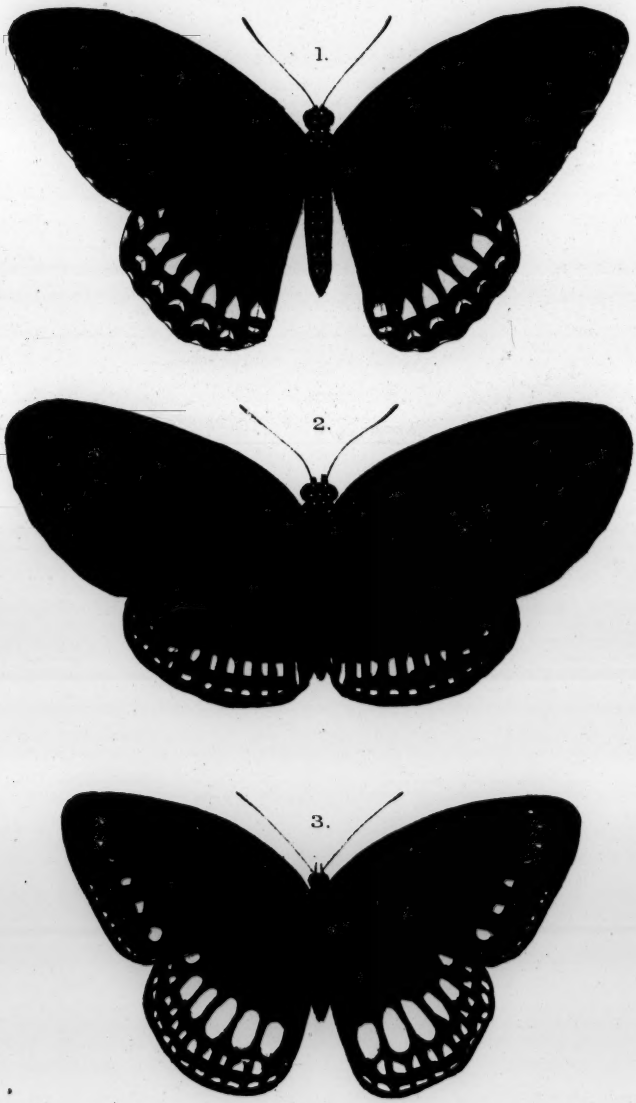
72. ARCA (SCAPHARCA) MYRISTICA, Reeve, Conch. Icon. ii. sp. 42.
Hab. Philippine Islands (*Cuming*).

73. PECTEN ALBOLINEATUS, Sowerby, Thesaurus Conch. pl. 14. figs. 69, 70.
Hab. Philippine Islands.

74. ISOGNOMON SAMOENSIS, Baird.
Perna (*Isognomon*) *samoensis*, Baird, 'Cruise of the Curaçoa,' p. 454, pl. 42. fig. 8.
Hab. Tutuila, Samoa Islands.

BRACHIOPODA.

75. LINGULA HIANS, Swainson; Sowerby, Thesaurus, i. pl. 67. fig. 4.
Hab. China.
Capt. Wilmer's notes on this species are as follows:—
"It lives in mud or sandy clay at low-water mark, the shell being buried about a foot from the surface. It is very easily alarmed, and

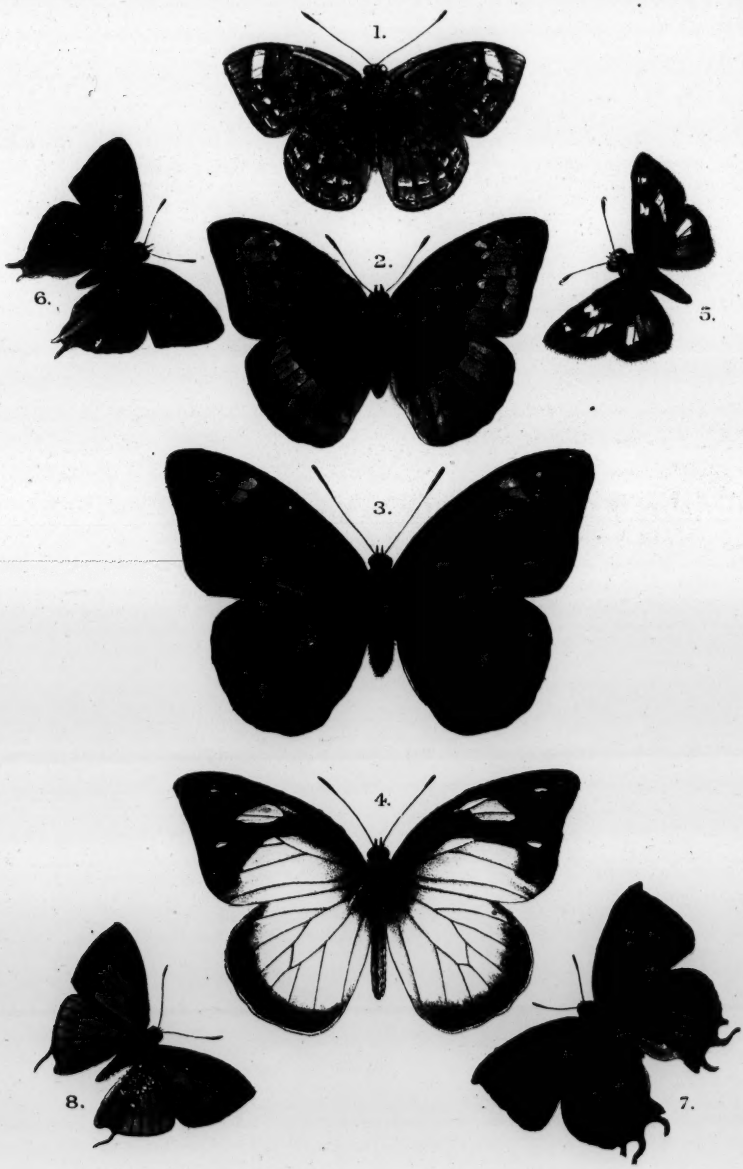


R. Mintern del.

Mintern Bros imp.

LEPIDOPTERA FROM UPPER TENASSERIM.

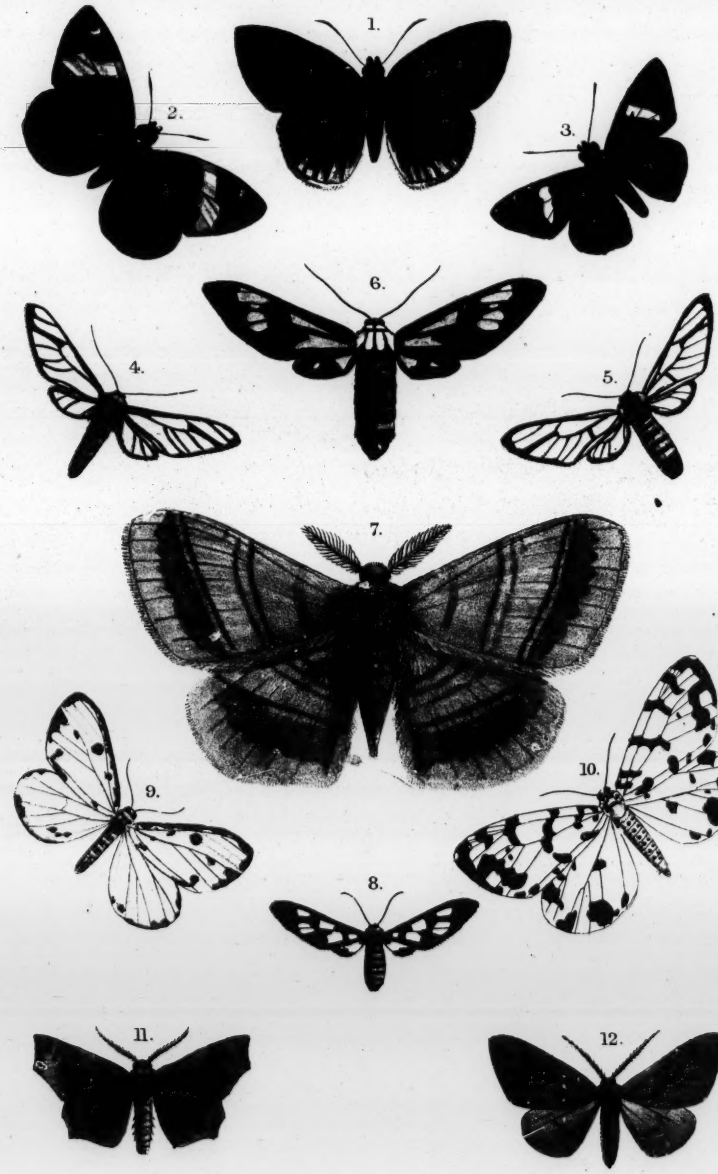
PRINCETON
15 JUN
MUSEUM



R. Mintern del.

Mintern Bros imp.

LEPIDOPTERA FROM UPPER TENASSERIM.



R. Mintern del.

Mintern Bros. imp.

LEPIDOPTERA FROM UPPER TENASSERIM.

retreats rapidly downwards. In order to collect specimens, I searched for oval orifices in the mud; and having found one, a spade was plunged very deeply in and the mud turned up, the hands then being used to go deeper; yet, still, in many cases, the creature was too quick for the diggers."

EXPLANATION OF PLATE L.

Fig. 1, 1 *a*. *Conus andamanensis*, p. 804.
2. *Pleurotoma* (*Drillia*) *variabilis*, p. 805.
3. —— (——) *variabilis*, var. p. 805.
4. —— (——) *wilmeri*, p. 805.
5. *Murex* (*Muricidea*) *rusticus*, p. 806.
6. *Columbella* (*Anachis*) *nigricostata*, p. 807.
7. *Nassa bifaria*, p. 808.
8. —— *marratii*, p. 809.
9. —— *echinata*, p. 810.
10. *Fusus almormis*, p. 811.
11. *Latirus decoratus*, p. 812.
12. —— *fastigium*, p. 812.
13. *Mitra mœsta*, p. 813.
14. —— *mariæ*, p. 813.
15. *Ranella pusilla*, var., p. 815.
16. *Triton* (*Simpulum*) *strangei*, p. 816.
17. *Torinia perspectiviunculus*, front view, p. 816.
17 *a*. Ditto, basal view.
17 *b*. Ditto, operculum.
18. *Cerithium* (*Vertagus*) *kochi*, p. 817.
19. —— (——) *turritum*, p. 817.
20. *Turritella infraconstricta*, p. 817.
21. *Trochus* (*Clanculus*) *microdon*, p. 818.
21 *a*. Ditto, variety.
21 *b*. Ditto, base.
22. *Trochus* (*Forskåhlia*) *pulcherrimus*, p. 818.
22 *a*. Ditto, base.
23. *Corbula fortisulcata*, upper view, p. 819.
23 *a*. Ditto, lower valve.
23 *b*. Ditto, top view.

7. A List of the Lepidopterous Insects collected by Mr. Ossian Limborg in Upper Tenasserim, with Descriptions of new Species. By F. Moore, F.Z.S., Assistant Curator, India Museum, London.

[Received September 17, 1878.]

(Plates LI.–LIII.)

This list comprises the Lepidopterous portion of the collection made on and around the Moulayet range in Upper Tenasserim by Mr. Limborg, who was accompanied by Mr. Wood-Mason's native collector, Motiram. The party proceeded, about the middle of December 1876, from Moulmein up the Houngduran, collecting as they went along to the Hills, on and around which, and along the banks of the river leading to them, the whole collection was made.

The expedition was organized and the funds provided by the Marquis of Tweeddale, President of the Zoological Society, Mr. W. T. Blanford, Lt.-Col. Godwin-Austen, Sir E. Clive Bayley, President, and Mr. J. Wood-Mason, Natural-History Secretary of the Asiatic Society, Calcutta, Mr. R. Lydekker, Dr. J. Anderson, Director of the Indian Museum, Calcutta, and others.

Papiliones.

Fam. Nymphalidæ.

Subfam. Danainæ.

Danais septentrionis.

Danais septentrionis, Butler, Ent. Mo. Mag. xi. p. 163 (1874).

Ahsown; Meetan, 3000 feet; Hatsiega; Houngduran source.

Danais aglea.

Danais aglea, Cramer, Pap. Exot. iv. tab. 377. f. E (1782).

Ahsown; Hatsiega; Naththoung to Paboga; Moolai, 3000–6000 feet.

Danais vulgaris.

Danais vulgaris, Butler, Ent. Mo. Mag. xi. p. 164 (1874).

Ahsown; Moulmein to Meetan; Houngduran source.

Danais melaneus.

Papilio melaneus, Cram. Pap. Exot. i. tab. 30. f. D (1775).

Ahsown; Moulmein to Meetan.

Danais tytia.

Danais tytia, Gray, Lep. Ins. Nepal, p. 9, pl. 9. f. 2 (1846).

Moolai to Moolat, 4500 feet.

Danais plexippus.

Papilio plexippus, Linn. Syst. Nat. i. 2, p. 767 (1767).

Ahsown; above Ahsown; Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000–5000 feet.

Danais chrysippus.

Papilio chrysippus, Linn. Syst. Nat. i. 2, p. 767 (1767).

Ahsown.

Salpinx rhadamanthus.

Papilio rhadamanthus, Fabr. Ent. Syst. iii. 1, p. 42 (1793).

Ahsown, 2000 feet; Meetan, 3000 feet; Hatsiega; Houngduran source; Naththoung to Paboga.

Salpinx crassa.

Euplœa crassa, Butler, Proc. Zool. Soc. 1866, p. 278.

Ahsown; Moulmein to Meetan; Hatsiega; Naththoung to Paboga; Taoo, 3000–5000 feet.

SALPINX MASONI, n. sp.

Male. Allied to *S. crassa*, Butler (Proc. Zool. Soc. 1866, p. 278), but differing in its darker colour, in the basal area of the fore wing being bright glossy blue, and the marginal spots on this wing confined more to the apex; hind wing less convex along the exterior margin; otherwise similarly marked.

Expanse $3\frac{1}{4}$ inches.

Taoo, 3000–5000 feet; above Ahsown. In coll. Wood-Mason.

From *S. klugii*, Moore, this species may be distinguished by the blue gloss being confined to the basal area, whereas in *S. klugii* it is more brilliant and suffuses the entire wing.

SALPINX MARGARITA.

Euplœa margarita, Butler, Proc. Zool. Soc. 1866, p. 279.

Hatsiega; Houngduran source.

TREPSICHROIS MIDAMUS.

Papilio midamus, Linn. Syst. Nat. i. 2. p. 765 (1767).

Ahsown, 2000 feet; Moulmein to Meetan; Hatsiega; Houngduran; Naththoung to Paboga.

CRASTIA CUPREIPENNIS, n. sp.

Allied to *C. modesta*, Butler, P. Z. S. 1866, p. 273, from Siam.

Upperside cupreous brown, the outer borders broadly paler, basal area of fore wing blue-glossed; cell and contiguous area of hind wing also blue-glossed; the two marginal series of spots larger.

Expanse $3\frac{1}{8}$ inches.

Hatsiega; Houngduran source. In coll. Wood-Mason.

EUPLŒA LIMBORGII, n. sp. (Plate LI. fig. 2.)

Male. Differs from *E. deione*, Westw., in the fore wing having some very indistinct submarginal white spots, and the hind wing having two marginal rows of prominent white spots similar to but smaller than those in *E. margarita*, Butler.

Expanse $3\frac{3}{4}$ inches.

Ahsown, 2000 feet; above Ahsown; Hatsiega; Houngduran. In coll. J. Wood-Mason.

EUPLŒA ALCATHOË.

Euplœa alcathoë, Godt. Enc. Méth. ix. p. 178 (1819).

Ahsown, 2000 feet.

EUPLŒA SUBDITA, n. sp.

Allied to *E. core*, Cram. Pap. Exot. pl. 266. figs. E, F.

Male. Fore wings shorter, broader, and the posterior margin more convex: upperside paler, basal area slightly blue, glossed in the fore wing; markings similar, smaller and paler, those on the fore wing indistinct.

Expanse $3\frac{1}{8}$ inches.

Hatsiega. In coll. J. Wood-Mason.

EUPLŒA GODARTII.

Euplœa godartii, Lucas, Rev. Zool. 1853, p. 319.

Ahsown; Moulmein to Meetan; Hatsiega; Houngduran; Naththoung to Paboga.

STICTOPLŒA GROTEI.

Euplœa grotei, Felder, Reise Nov., Lep. ii. p. 339, tab. 49. 1, ♀.

Ahsown; above Ahsown; Hatsiega to Houngduran.

Subfam. SATYRINÆ.

LETHE ARCADIA.

Papilio arcadia, Cram. Pap. Exot. ii. tab. 116. f. E, F (1779).

Ahsown.

LETHE MEKARA.

Debis mekara, Moore, Catal. Lep. Mus. E.I. C. i. p. 219 (1857).

Ahsown, 2000 feet; Taoo, 3000–5000 feet.

LETHE ROHRIA.

Papilio rohria, Fabr. Mant. Ins. ii. p. 45 (1787).

Hatsiega; Naththoung to Paboga; Taoo, 3000–5000 feet.

LETHE VERMA.

Satyrus verma, Kollar, Hügel's Kasch. iv. p. 447, tab. 16. f. 1, (1844).

Moolai, 3000–6000 feet.

MELANITIS ISMENE.

Papilio ismene, Cram. Pap. Exot. i. tab. 26. f. A, B (1775).

Ahsown, 2000 feet; Moulmein to Meetan; Meetan, 3000 feet; Naththoung to Paboga; Moolai, 3000–5000 feet.

MELANITIS BELA.

Melanitis bela, Moore, Catal. Lep. Mus. E.I. C. i. p. 223 (1857).

Ahsown; Meetan, 3000 feet, April; Naththoung to Paboga; Moolai, 3000–6000 feet; Moolai to Moolat, 4500 feet.

ZETHERA DIADEMOIDES, n. sp. (Plate LI. fig. 3.)

Male and female. Upperside dark brown: fore wing with a submarginal series of seven small bluish-white spots, which decrease in size to the costa; a marginal series of smaller less distinct spots, two between each vein: hind wing with a series of six large broad oval spots; a submarginal series of small reversely triangular spots, and a marginal series of smaller narrow spots, the two latter series with two of these spots disposed between the veins. Underside as above.

Expanse, ♂ 3, ♀ 3¼ inches.

Taoo, 3000–5000 feet, March; Moulai, 3000–6000. In coll. J. Wood-Mason.

MYCALESIS MINEUS.

Papilio mineus, Linn. Syst. Nat. i. 2, p. 758 (1767).

Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000–5000 feet, March.

MYCALESIS PERSEUS.

Papilio perseus, Fabr. Syst. Ent. p. 488 (1775); Butler, Proc. Zool. Soc. 1867, p. 719, fig. 2.

Moulmein to Meetan.

MYCALESIS BLASIUS.

Papilio blasius, Fabr. Ent. Syst. Suppl. p. 426 (1798); Butler, Proc. Zool. Soc. 1867, p. 718, fig. 4.

Moulmein to Meetan.

MYCALESIS ANAXIAS.

Mycalesis anaxias, Hewitson, Exot. Butt. iii. *Myc.* pl. 4. f. 25, 26 (1862).

Ahsown; Moolai, 3000–6000 feet.

MYCALESIS RUNEKA.

Mycalesis runeka, Moore, Catal. Lep. E.I. C. i. p. 234 (1857).

Ahsown; Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

CULAPA, n. g.

Differs in form from *Mycalesis*, having a greater length of fore wing, less convexity of the costa, the apex being more produced and the exterior margin more oblique; the hind wing is somewhat acutely angled at the apex, and the exterior margin produced before the anal end, thus giving this wing a quadrate appearance. In form it more resembles the American genus *Anchiphlebia*.

CULAPA MNASICLES.

Mycalesis mnasicles, Hewits. Exot. Butt. iii. *Myc.* pl. 5. f. 32, 33 (1864).

Ahsown, 2000 feet; Meetan, 3000 feet, April.

YPHTHIMA BALDUS.

Papilio baldus, Fabr. Syst. Ent. App. p. 809 (1775); Donov. Ins. Ind. t. 36. f. 2.

Moulmein to Meetan.

YPHTHIMA METHORA.

Yphthima methora, Hewitson, Trans. Ent. Soc. 1865, p. 291, pl. 18. f. 20, 21.

Naththoung to Paboga.

ERITES ANGULARIS, n. sp.

Male. Wings longer than in *E. madura*, Horsf. (from Java);

the fore wing being more produced at the apex and the hind wing posteriorly. Underside similarly marked, excepting that the yellow-bordered black spot on the fore wing is more oval, and the spots on the hind wing smaller, this wing also having the inner yellow band acutely angled in the middle.

Expanse $2\frac{1}{2}$ inches.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

ELYMNIAS TINCTORIA, n. sp.

Allied to *E. undularis*, of India.

Male. Upperside dark blue-black, the marginal blue spots on fore wing larger; border of hind wing dusky purple, with a series of small white spots. *Female* with prominent blue-black borders and white markings.

Expanse 3 inches.

Meetan, 3000 feet, April; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

ELYMNIAS VASUDEVA.

Elymnias vasudeva, Moore, Catal. Lep. E.I. C. i. p. 238 (1857).

Taoo, 3000–5000 feet.

DYCTIS LEUCOCYMA.

Biblis leucocyma, Godt. Enc. Méth. ix. p. 326 (1819).

Ahsown.

Subfam. NYMPHALINÆ.

AMATHUSIA PHIDIPPUS.

Papilio phidippus, Linn. Syst. Nat. i. 2, p. 752 (1767); Cramer, Pap. Exot. i. tab. 69. f. A, B.

Meetan, 3000 feet, April.

ZEUXIDIA MASONI, n. sp.

Allied to *Z. amethystus*, Butler, P. Z. S. 1865, p. 485, from Sumatra.

Female. Differs in the paler colour of the wings, and in the greater breadth of the yellow oblique band, the band entire and terminating at the middle median branch, below which are two similar-coloured spots; a small pale patch before apex of the wing; hind wing pale cinnamon-brown broadly along outer border.

Expanse $4\frac{1}{2}$ inches.

Meetan, 3000 feet, April. In coll. J. Wood-Mason.

DISCOPHORA TULLIA.

Papilio tullia, Cramer, Pap. Exot. i. tab. 81. f. A, B (1779).

Above Ahsown.

DISCOPHORA ZAL.

Discophora zal, Westw. Gen. D. Lep. p. 331 (1851); Trans. Ent. Soc. 1858, p. 188, pl. 21. f. 5, 6.

Taoo, 3000–5000 feet; Moolai, 3000–6000 feet.

DISCOPHORA NECHO.

Discophora necho, Felder, Reise Nov., Lep. iii. p. 462 (1867).
D. celinde, Horsf. Catal. Lep. E.I. C. pl. 6. f. 6.
Houngduran source.

CLEROME ARCESILAÜS.

Papilio arcesilaus, Fabr. Mant. Ins. ii. p. 28 (1787); Donov. Ins. Ind. pl. 30. f. 2.
Above Ahsown.

ÆMONA LENA.

Æmona lena, Atkinson, Proc. Zool. Soc. 1871, p. 215, pl. 12. f. 1.
Moolai, 3000–6000 feet.

XANTHOTÆNIA BUSIRIS.

Xanthotænia busiris, Westw. Trans. Ent. Soc. 1858, p. 187.
Moolai, 3000–6000 feet.

THAUMANTIS LOUISA.

Thaumantis louisa, Wood-Mason, Proc. As. Soc. Beng. 1877, p. 163; id. Journ. As. Soc. Beng. 1878, pl. xii.
Taoo, 3000–6000 feet.
Allied to *T. howqua*, but differs in having the upper surface white instead of fulvous, and in having five red spots instead of ocelli on the underside of the fore wings, and only two well-developed ocelli (the anterior and posterior) on the hind wings, instead of three and five ocelli respectively.

CIRROCHROA SURYA, n. sp.

Allied to *C. lanka* (Moore, P. Z. S. 1872, p. 557) of Ceylon.
Male differs above on the fore wing in the narrower marginal band, a single sinuous line extending with fulvous interspaces to near the apex; hind wing with the submarginal line more sharply sinuous; other markings similar. Underside purplish fulvous grey; the discal transverse band broader, and pale bluish purple on the fore wing, bluish purple-white on hind wing, its outer border being dark blue, and its inner border red and waved; other markings red. *Female* darker above, the discal black line sinuous at the costal end; a double sinuous marginal line; other markings and underside as in male.
Expanse, ♂ 1⅞ to 2⅜, ♀ 2¾ inches.
Moulmein to Meetan; Taoo, March, 3000–5000 feet; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

MESSARAS ERYMANTHIS.

Papilio erymanthis, Drury, Ill. Exot. Ent. i. pl. 15. f. 3, 4 (1773).
Moolai to Moolat; Hatsiega.

ATELLA SINHA.

Terinos sinha, Kollar, Hügel's Kasch. iv. p. 438 (1844).

A melanoid variety. Moulmein.

JUNONIA LAOMEDIA.

Papilio laomedia, Linn. Syst. Nat. i. 2, p. 772 (1767); Drury, Ill. Exot. Ent. pl. 5. f. 3.

Ahsown, 2000 feet; Moulmein to Meetan; Naththoung to Paboga.

JUNONIA LEMONIAS.

Papilio lemonias, Linn. Syst. Nat. i. 2, p. 770 (1767).

Ahsown, 2000 feet; Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000–6000 feet (March); Naththoung to Paboga.

JUNONIA ORITHYIA.

Papilio orithyia, Linn. Syst. Nat. i. 2, p. 770 (1767); Cram. Pap. Exot. i. tab. 19. f. C, D, tab. 32. f. E, F.

Moulmein to Meetan.

JUNONIA ALMANA.

Papilio almana, Linn. Syst. Nat. i. 2, p. 769 (1767); Cram. Pap. Exot. i. tab. 58. f. F, G.

Ahsown, 2000 feet; Moulmein to Meetan; Taoo, 3000–5000 feet.

PRECIS IPHITA.

Papilio iphita, Cram. Pap. Exot. iii. tab. 209. f. C, D.

Moolai, 3000–6000 feet.

DOLESCHALLIA PRATIPA.

Doleschallia pratipa, Felder, Wien. ent. Mon. iv. p. 399 (1860); Reise Nov., Lep. iii. p. 206.

Hatsiega.

KALLIMA LIMBORGII, n. sp.

Differs from *K. inachis*, from Sikkim. Male and female of a deeper and more uniform steel-blue colour above; the fore wing is not angled on the hindward part of the exterior margin; the apex more produced in the male and less so in the female, the discal hyaline spot small, and almost circular; the hind wing also is less convex on the exterior margin, and has a much shorter tail.

Expanse, ♂ 3¾, ♀ 4 inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

CYRESTIS THYODAMAS.

Cyrestis thyodamas, Boisd. Cuv. Règ. Anim. Ins. ii. t. 138. f. 4 (1836).

Amathusia ganescha, Kollar, Hügel's Kasch. iv. p. 430, tab. 7. f. 3, 4.

Moolai, 3000–6000 feet.

CYRESTIS COCLES.

Papilio cocles, Fabr. Mant. Ins. ii. p. 7 (1787); Donov. Ins. Ind. pl. 23. f. 2.

Hatsiega.

CYRESTIS RISA.

Papilio risa, Doubleday, Gen. D. Lep. pl. 32. f. 4 (1850).

Moulmein to Meetan; Moolai, 3000–6000 feet.

HERONA ANGUSTATA, n. sp.

Female. Similar to *H. marathus* from the Khasia hills. Differs from same sex of that species in having all the maculated bands narrower, these being but half the width of those in the former species.

Expanse 3 inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

PENTHEMA DARLISA, n. sp.

Male and Female. Differs from *P. lisarda*, Doubleday (Gen. D. L. pl. 39. f. 3), on the fore wing in all the markings, except the streak along posterior margin, being bluish white and smaller, those within the cell oval, two at the base and two near the end; the discal series also are short and conical (not continuing outward to the inner transverse series), the streak between the lower median and submedian vein only being elongated. On the hind wing the pale luteous interspaces between the veins are deeply excavated at their end and partly coalesce with the inner transverse series of spots (the spots being larger), the outer row are also larger, conical, and deeply excavated externally; a black streak traverses the cell.

Expanse 5 inches.

Meetan, 3000 feet (April). In coll. J. Wood-Mason.

PARTHENOS APICALIS, n. sp.

Distinguished from *P. gambrisius* by the fore wing having the white band quite diaphanous, without any borders to the veins, and extending broadly and uninterruptedly to the costal margin, thence continuing along it to the extreme apex.

Expanse $3\frac{1}{2}$ inches.

Above Ahsown; Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

LEBADEA ATTENUATA, n. sp.

Male and Female. Differ from *L. ismene*, Doubleday (Gen. D. Lep. pl. 34. f. 2), in being smaller and of a brighter colour, the white medial transverse band narrower, the apical portion on fore wing more angular in position and extending to the costa, the outer series of narrow lunules being present on the hind wing in both sexes.

Expanse, ♂ 2, ♀ $2\frac{1}{2}$ inches.

Hatsiega; Naththoung to Paboga. In coll. J. Wood-Mason.

NEPTIS ADARA, n. sp.

Allied to *N. varmona*, from S. India. Differs above in the maculated bands being narrower, the discoidal terminal spot broader and less pointed, the discal series of spots more oval in shape, and the submarginal series not so prominent. On the underside the ground-colour is much brighter, and the markings are less black-bordered.

Expanse, ♂ 2, ♀ $2\frac{2}{10}$ inches.

Moulmein to Meetan; Ahsown; Naththoung to Paboga; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

NEPTIS MEETANA, n. sp.

Allied to the preceding (*N. adara*), but with the markings above more like those in *N. andamana*. It is a somewhat narrower-winged insect, the spots of the discal band relatively narrower in both sexes, the underside of a brighter red, and the markings less black-bordered.

Expanse, ♂ 2, ♀ $2\frac{1}{8}$ inches.

Meetan 3000 feet, March; Taoo, 3500 feet. In coll. J. Wood-Mason.

NEPTIS JUMBA.

Neptis jumba, Moore, Catal. Lep. Mus. E.I. C. i. p. 167 (1857).

Moulmein to Meetan.

NEPTIS ADIPALA.

Neptis adipala, Moore, Proc. Zool. Soc. 1872, p. 563, pl. 22. f. 8.

Moulmein to Meetan; Hatsiega.

NEPTIS PLAGIOSA, n. sp.

Allied to *N. hordonia*, Stoll, Cram. Pap. v. pl. 33. f. 4.

Differs on the upperside in all the ferruginous bands being broader, the fore wing having the lengthened discoidal band spreading over the median vein, the marginal line also broader and very distinct; hind wing with the submarginal band nearly as broad as the discal. On the underside the strigæ are more numerous and darker, covering both bands on the hind wing.

Expanse, ♂ $1\frac{4}{8}$, ♀ $1\frac{7}{8}$ inch.

Naththoung to Paboga. In coll. J. Wood-Mason and F. Moore.

ADOLIAS LEPIDEA.

Adolias lepidea, Butler, Ann. Nat. Hist. 1868, i. p. 71.

Meetan, 3000 feet, April.

ADOLIAS SATROPACES.

Adolias satropaces, Hewitson, Entom. Monthly Mag. 1876, p. 150; id. Desc. Lep. Coll. Atk. Asiat. Soc. Bengal, p. 1, pl. 1. f. 6, 7, 8 (1878).

Meetan, 3090 feet, April.

ADOLIAS PARVATA, n. sp. (Plate LII. fig. 3.)

Female allied to *A. sedeva*, Moore, Trans. Ent. Soc. 1859, p. 68, pl. 4. f. 3. Differs above on the fore wing in the discal band being narrower, the costal portion only partially whitish, and the lower portion without the whitish inner border. Underside with the band on fore wing only partially white anteriorly, the lower portion with a slight white lunule to the inner border, and white point with black tip to outer border.

Expanse $2\frac{3}{4}$ inches.

Hab. Meetan, 3000 feet, April. In coll. J. Wood-Mason.

ADOLIAS DISCISPILOTA, n. sp. (Plate LII. fig. 2.)

Allied to *A. kesava*, Moore, Trans. Ent. Soc. 1859, p. 67, pl. 3. f. 5.

Female. Smaller in size: upperside with the borders uniformly greyish brown; the transverse discal band with less sinuous dusky outer border; the whitish spot between the lower subcostal branches and the spot between the upper median branches prominent. Underside paler; markings similar, with less blue along abdominal border.

Expanse $2\frac{2}{10}$ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

ADOLIAS JAHNU.

Adolias jahnu, Moore, Catal. Lep. Mus. E.I.C. i. p. 192 (1857); Trans. Ent. Soc. 1859, p. 74, pl. 7. f. 1.

Hatsiega; Taoo, 3000–5000 feet.

ADOLIAS TAOOANA, n. sp.

Allied to *A. iva* (Moore, Trans. Ent. Soc. 1857, pl. 8 f. 2). Fore wing with the oblique discal maculated band with shorter lower portions, the penultimate spot quite oval, the last being short and conical; the two contiguous spots beneath are also smaller, and the two before the apex closer together; on the hind wing the three subapical spots are contiguous, the two upper being large, quadrate, and excavated externally.

Expanse 4 inches.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

CHARAXES SAMATHA, n. sp.

Smaller than Indian examples of *C. athamas*, the yellow band on both wings one third less in width, the subapical spot smaller, and the apical either minute or obsolete.

Expanse $2\frac{3}{8}$ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

CHARAXES MARMAX.

Charaxes marmax, Westwood, Cab. Orient. Ent. p. 43, pl. 21. f. 3–5 (1848).

Moolai, 3000–6000 feet.

CHARAXES DESA, n. sp.

Male. Allied to *C. marmax*, Westw. Cab. Orient. Ent. pl. 21. f. 3. Differs on fore wing above in the marginal black band being broader and extending at the apex further along the costa, the inner submarginal lunular line is closer to the band; the black maculated band on the hind wing is formed of larger angled spots. Underside purplish ochreous; hind wing with a transverse black lunular fascia, which is also further from the outer margin.

Expanse $3\frac{1}{2}$ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Also distinct from *C. lunawara*, Butler.

CHARAXES AGNA, n. sp.

Male. Allied to *C. harpax*, Feld. Nov. Voy., Lep. iii. p. 444. Differs in its larger size, broader marginal black band on the fore wing, and in the hind wing having a less black apical patch, the marginal series of spots also being much smaller.

Expanse $3\frac{1}{4}$ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

CHARAXES HARPAX.

Charaxes harpax, Felder, Reise Nov., Lep. iii. p. 444 (1867).

Moulmein to Meetan; Moolai, 3000–6000 feet.

PROTHOË FRANCKII.

Nymphalis franckii, Godt. Enc. Méth. ix. Suppl. p. 825; Horsf. Catal. Lep. E.I. C. (1829), pl. 5 f. 4, 4 *a*.

Meetan, 3000 feet, April.

Subfam. LIBYTHÆINÆ.

LIBYTHEA MYRRHA.

Libythea myrrha, Godt. Enc. Méth. ix. p 171; Boisd. Sp. Gén. Lép. i. t. 10. f. 8.

Moulmein to Meetan; Hatsiega.

Fam. ERYCINIDÆ.

ZEMEROS FLEGYAS.

Papilio flegyas, Cram. Pap. Exot. iii. pl. 280. f. E, F (1782).

Ahsown, 2000 feet.

TAXILA FASCIATA, n. sp. (Plate LII. fig. 1.)

Allied to *T. drupadi*, Horsf. Catal. Lep. Mus. E.I. C. 1828, pl. 2. f. 3, from Java.

Male. Differs above in the apex of the fore wing being less suffused with red, and having an oblique subapical indistinct whitish fascia. Underside similarly marked, with the subapical fascia distinct, well-defined, and pure white.

Expanse $1\frac{7}{8}$ inch.

Above Ahsown. In coll. J. Wood-Mason.

ABISARA NEOPHRON.

Sospita neophron, Hewitson, Exot. Butt. ii. *Sosp.* pl. i. f. 3 (1861).

Moolai, 3000–6000 feet.

ABISARA ANGULATA, n. sp.

From *A. kausambi*, Felder, of the Malay peninsula, this species differs in the male above being paler plum-colour, the fore wing showing the transverse discal fasciæ, and the hind wing the apical and anal black spots; the female above is also paler purple-brown, the inner discal band is angled at the middle of its inner border on both wings, and is only slightly paler at its costal end. On the underside, the discal bands are angled in the middle, the inner band being narrowly bordered with brownish white at its costal end only in the male, its entire length in the female.

Expanse $1\frac{1}{2}$ inch

Above Ahsown; Hatsiega; Naththoung to Paboga. In coll. J. Wood-Mason.

An entirely different insect from the Andaman *A. bifasciata*, Moore, P. Z. S. 1877, p. 587, pl. 58. f. 1.

Fam. LYCÆNIDÆ.

CASTALIUS ROXUS.

Lycæna roxus, Godt. Enc. Méth. ix. p. 659 (1823); Horsf. Catal. Lep. E.I. C. 1828, p. 70, pl. 2. f. 4.

Moulmein to Meetan.

LAMPIDES ALEXIS.

Papilio alexis, Stoll, Suppl. Cramer's Pap. Exot. pl. 38. f. 3 (1790).

Moulmein to Meetan; Naththoung to Paboga.

LAMPIDES ÆLIANUS.

Papileo ælianus, Fabr. Ent. Syst. iii. 1, p. 280 (1793).

Moulmein to Meetan.

LAMPIDES ELPIS.

Lycæna elpis, Godt. Enc. Méth. ix. p. 654 (1823); Horsf. Catal. Lep. E.I. C. 1828, p. 96, pl. 1. f. 4.

Ahsown; Moulmein to Meetan.

LAMPIDES KANDARPA.

Lycæna kandarpa, Horsf. Catal. Lep. Mus. E.I. C. 1828, p. 82.

Moulmein to Meetan

HYPOLYCÆNA LISIAS.

Papilio lisias, Fabr. Mant. Ins. p. 65 (1787); Donov. Ins. Ind. pl. 40. f. 1; Boisd. Spec. Gén. Lép. i. t. 22. f. 2.

Ahsown; Meetan, April; Moolai 3000–6000 feet.

MYRINA FREJA.

Papilio freja, Fabr. Ent. Syst. iii. 1, p. 263 (1793); Butler, P. Z. S. 1867, pp. 34, 36, f. 1.

Ahsown; Moulmein to Meetan; Taoo, 3000–5000 feet.

THAMALA, n. g.

Male and Female. Fore wing short, broad, trigonate; costa convex at base, apex moderately acute, exterior margin slightly oblique and recurved, posterior margin nearly straight, angle acute; cell broad, short; subcostal vein four-branched, first, second, and third arising before end of the cell, fourth at its end; discocellulars slightly curved outward; radial from their middle; median vein three-branched, two upper contiguous at base from end of the cell: hind wing elongated posteriorly, narrow and quadrate below anal margin; with two narrow lengthened tails, one at each angle; exterior margin slightly waved. Body moderate; antennæ stout, uniformly thickened to apex; palpi long, squamous, second joint projecting half its length beyond the head, apical joint slender; legs squamous, femora slightly pilose beneath.

Differs from *Deudorix* (*D. melampus* (*jarbas*, Fabr.) and *D. epijarbas*) in its shorter and broader fore wings and longer hind wings, the fore wings having only four subcostal branches (there being five in both the above species), and in the antennæ being more robust.

THAMALA MINIATA, n. sp. (Plate LII. fig. 6.)

Male and Female. Upperside deep scarlet-vermilion: fore wing with the base, costal and the outer border broadly black, confining the red colour to a circular area; veins also black-lined, the median prominently so and forming a slight streak at the base of its branches: hind wing black at the extreme base, along abdominal border and slightly along median veins; exterior border narrowly black, some black speckles ascending between lower median branch and submedian vein; tails red, black-margined and white-tipped in female. Underside luteous-yellow in male, ochreous-yellow in female: both wings with indistinct dusky discal zigzag-lunular line terminating above anal angle in a white-speckled patch: fringe of hind wing black, the margin also black-lined from the angle; space above the tails black- and white-speckled. Body beneath, legs, and palpi white, speckled with black, tip of palpi black.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{4}{10}$ inch.

Taoo, 3500 feet. In coll. J. Wood-Mason.

DEUDORIX SUFFUSA, n. sp. (Plate LII. fig. 8.)

Allied to *D. xenophon*, male. Wings slightly broader: upperside of fore wing with broader outer band, the red colour suffused with dusky-brown; hind wing also duller red. Underside dull sulphur-yellow; transverse lunular line more curved, the zigzag end at anal angle black and with an additional similar line above its end.

Expanse $1\frac{4}{10}$ inch.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

LOXURA ATYMNUS.

Papilio atymnus, Cram. Pap. Exot. iv. t. 331. f. D, E (1782).

Ahsown; Meetan, 3000 feet, April; Moolai, 3000–6000 feet.

AMBLYPODIA TAOOANA, n. sp.

Differs from *A. narada* and *A. anita* in its larger size, the upper-side being of a very brilliant blue colour as in *A. silhetensis*, and the outer black marginal band twice the width of that of those species. Underside purplish-ochreous, the transverse black-speckled band and basal speckled markings prominent, the band on fore wing being much curved, the outer markings also prominent.

Expanse 2 inches.

Taoo, 3500 feet. In coll. J. Wood-Mason.

NARATHURA, n. g.

Wings broad: fore wing very convex at base of costa, exterior margin rounded, even: hind wing very convex externally, with even margin; a very slender tail at end of lower median vein (so delicate that in most cabinet specimens it is broken off); anal angle not lobed.

Type *N. hypomuta* (*Amblypodia hypomuta*, Hewits. Catal. Lyc. B. M. p. 11, pl. 6. figs. 63, 64, 1862).

NARATHURA MOOLAIANA, n. sp.

Amblypodia epimuta, Hewitson, Catal. Lyc. B.M. p. 11, pl. 6. f. 59, 60 (1862).

Taoo, 3000–5000 feet. Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

This is a distinct species from *N. epimuta*, Moore, Catal. Lep. Mus. E.I.C. i. p. 42, the type of which is from Borneo.

ARHOPALA NAKULA, Feld. Wien. ent. Monats. iv. p. 395 (1860).

Taoo, 3000–5000 feet.

ARHOPALA VIHARA, Feld. Wien. ent. Monats. iv. p. 395 (1860).

Taoo, 3000–5000 feet.

SURENDRA, n. g.

Allied to *Thaduka*. Sexes dissimilar in colour above: fore wing short, broad, costa slightly arched, apex acute, exterior margin in female very convex in the middle, less so in male; hind margin nearly straight: hind wing short, somewhat quadrate; anterior margin nearly straight, apex angled; exterior margin nearly straight anteriorly, truncate posteriorly, and in male with one tail situated at end of lower median vein, in female with two tails, one at the lower, the other at the middle median vein, anal lobe large. Venation similar to *Thaduka*. Palpi long, slender; legs short; antennæ uniformly thickened.

SURENDRA QUERCETORUM.

Amblypodia quercetorum, Moore, Catal. Lep. Mus. E.I. C. i. p. 42, pl. 1 *a*. f. 7 (1857).

THADUKA, n. g.

Allied to *Mahathala*. Fore wing short, broad, costa very convex at base, apex acutely angled; exterior margin erect, scalloped; posterior angle lobular; hind margin same length as costal, concave in the middle: hind wing short, broad, anterior margin convex, apex and exterior margin very convex, sinuous, with three prominent tails, the middle one longest, and large anal lobe; abdominal margin very concave above anal lobe. Venation similar to *Mahathala* (*Amblypodia ameria*, Hewitson). Body short, stout; antennæ uniformly thickened to end; palpi slender; legs short.

THADUKA MULTICAUDATA, n. sp. (Plate LII. fig. 7.)

Female. Upperside purple-black, basal area bright smalt-blue. Body and abdominal border greyish, thorax blue. Underside dark vinous-brown; fore wing with short subbasal, medial, and an entire discal, purple-black maculate bands, and an outer marginal series of lunules: hind wing with three irregular curved transverse purplish-black maculate bands, and indistinct marginal lunules; a narrow metallic-green lunule above the tails.

Expanse $1\frac{5}{8}$ inch.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

Fam. PAPILIONIDÆ.

Subfam. PIERINÆ.

TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. 2, p. 763 (1767).

Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

TERIAS SUAVA.

Terias suava, Boisd. Spec. Gén. Lép. p. 670 (1836).

Moulmein to Meetan.

TERIAS SILHETANA.

Terias silhetana, Wallace, Trans. Ent. Soc. 1867, p. 324.

Moulmein to Meetan; Hatsiega to Houngduran; Naththoung to Paboga.

TERIAS FORMOSA.

Eurema formosa, Hübn. Zutr. exot. Schmett. f. 979 (1837).

Hatsiega.

TERIAS LÆTA.

Terias læta, Boisd. Spec. Gén. Lép. i. p. 674 (1836).

Moulmein to Meetan.

NYCHITONIA XIPHIA.

Papilio xiphia, Fabr. Spec. Gén. Lép. ii. p. 43.
P. nina, Fabr. Ent. Syst. iii. 1, p. 191.
Ahsown; above Ahsown.

CALLIDRYAS CATILLA.

Papilio catilla, Cram. Pap. Exot. iii. t. 229. f. D, E (1782); Butler, Lep. Exot. i. p. 24, pl. 9. f. 7–10.
Hatsiega to Houngduran; Naththoung to Paboga; Moolai, 3000–6000 feet.

CALLIDRYAS CROCALE.

Papilio crocale, Cram. Pap. Exot. i. t. 52. f. C, D (1779); Butler, Lep. Exot. i. p. 22, pl. 9. f. 1, 2.
Moolai to Meetan.

HEBOMOIA GLAUCIPPE.

Papilio glaucippe, Linn. Syst. Nat. i. 2, p. 762 (1767).
Houngduran source.

IXIAS PALLIDA, n. sp.

Nearest to *I. andamana*, Moore, P. Z. S. 1877, p. 590. Upperside of the same pale colour, the orange band on fore wing slightly wider, and having a more convex outer margin, the inner black border also broader, and the marginal band on hind wing wide and of equal width throughout. Underside differs in having a uniform series of delicate black strigæ and a cell-spot on both wings.
Expanse $2\frac{3}{8}$ inches.
Moolai, 3000–6000 feet. In coll. J. Wood-Mason.
From *I. latifasciata*, Butler, this species differs in its much paler colour above and beneath, and in the absence of the dark blotches on the underside.

IXIAS CITRINA, n. sp.

Male. Allied to the preceding; the orange band comparatively narrower and shorter hindward, its black inner border also narrower, and the marginal band on hind wing only half its width. Underside darker, with more prominent black strigæ and cell-spot, and with a submarginal series of brown-speckled spots with whitish centre.
Expanse 2 inches.
Houndurang source. In coll. J. Wood-Mason.
This also may be distinguished from *I. latifasciata*, by the colour above and by the narrow band on the hind wing.

IXIAS MOULMEINENSIS, n. sp.

Male and Female. Near to *I. pirenassa*, Wallace, from Madras. Upperside of the same bright yellow, the orange band in male much broader anteriorly; pale blackish band on hind wing narrow and not extending to posterior angle. Underside dull ochreous-yellow, with

delicate dark strigæ, and submarginal brown spots centred with white. Female with moderately broad orange band.

Expanse, ♂ 2, ♀ 1¾ inch.

Moulmein to Meetan. In coll. J. Wood-Mason.

ERONIA LUTESCENS, Butler.

Moulmein to Meetan.

CATOPHAGA NEOMBO.

Pieris neombo, Boisd. Spec. Gén. Lép. i. p. 539 (1836), Moore, Catal. Lep. Mus. E.I. C. i. pl. 2A. f. 3.

Moulmein to Meetan (a single female).

CATOPHAGA PAULINA.

Pieris paulina, Cram. Pap. Exot. ii. t. 110. f. E, F (1779).

Moulmein to Meetan; Hatsiega to Houngduran; Naththoung to Paboga.

(All males.)

CATOPHAGA LAGELA, n. sp. (Plate LII. fig. 4.)

Allied to *C. lalage*, Doubleday, D. Lep. pl. 6. f. 3.

Male and Female. Smaller. Upperside differing on the fore wing in the black apical border terminating in both sexes before reaching the posterior angle, and the medial portion partly excavated outside the lower end of the cell and thence extending across the end to its base; hind wing with a broad marginal continuous band (as in *C. pandione*, Hübn.). Underside—fore wing with the black band terminating as above; the apex and hind wing greyish-yellow, speckled with purple in male, and brownish-grey with darker speckles in female, the speckles numerous across the disk, and forming zigzag fasciæ.

Expanse 2½ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

APPIAS LEA.

Pieris lea, Doubleday, Ann. Nat. Hist. 1846, p. 23.

P. clemanthe, Doubleday, Gen. D. Lep. pl. 6. f. 3.

Moolai, 3000–6000 feet.

APPIAS NAMA.

Pieris nama, Moore, Catal. Lep. Mus. E.I. C. i. p. 76 (1857); Proc. Zool. Soc. 1857, p. 102, pl. 44. f. 1, 2.

Houngduran source; Taoo, 3000-5000 feet (March); Moolai, 3000–6000 feet; Moolai to Moolat, 4000–5000 feet.

APPIAS DAPHA, n. sp.

Allied to *A. zeuzippe*, Cram.

Male differs on the upperside in being white; the apical band on the fore wing more like that of *A. nama*, narrower, deeply scalloped within; anterior spots obsolete; and the contiguous discal spots

between the two upper median branches scarcely perceptible; marginal spots on hind wing indistinct, speckles disconnected. Underside white; apex of fore wing slightly dusky grey; subcostal and median vein within the cell, and all the veins of hind wing with dusky borders.

Female also white; apical band on fore wing without anterior spots; other markings similar but less prominent.

Expanse $1\frac{7}{8}$ inch.

Moulmein to Meetan. In coll. J. Wood-Mason.

APPIAS ZELMIRA.

Papilio zelmira, Cram. Pap. Exot. iv. t. 320. f. C, D (1782).

Moulmein to Meetan.

APPIAS AMBA.

Pieris amba, Wallace, Trans. Ent. Soc. 1867, p. 340.

Moulmein to Meetan; Houngduran source.

APPIAS VACANS.

Appias vacans, Butler, Trans. Ent. Soc. 1870, p. 490, ♀.

Moulmein to Meetan; Hatsiega to Houngduran.

DELIAS PASITHOË.

Papilio pasithoë, Linn. Syst. Nat. i. 2, p. 755 (1767).

Ahsown, 2000 feet; Taoo, 3000–5000 feet (March).

DELIAS INDICA.

Thyca indica, Wallace, Trans. Ent. Soc. 1867, p. 351.

Above Ahsown; Moulmein to Meetan. Moolai, 3000–6000 feet.

DELIAS DESCOMBESI.

Pieris descombesi, Boisd. Spec. Gén. Lép. i. p. 465.

Ahsown; Moolai, 3000–6000 feet.

PRIONERIS WATSONI.

Prioneris watsoni, Hewitson, Trans. Ent. Soc. 1868, p. 100.

Moulmein to Meetan; Houngduran source.

PRIONERIS CLEMANTHE.

Pieris clemanthe, Doubleday, Ann. Nat. Hist. 1846, p. 23.

P. helferi, Felder, Reise Nov., Lep. ii. p. 161, t. 25. f. 10.

Houngduran source; Naththoung to Paboga.

Subfam. PAPILIONINÆ.

PAPILIO TELEARCHUS.

Papilio telearchus, Hewitson, Trans. Ent. Soc. 1852, p. 22, pl. 6. f. 3.

Hatsiega.

PAPILIO XENOCLES.

Papilio xenocles, Doubleday, Gray's Zool. Misc. p. 74; Gen. D. Lep. pl. 1*. fig. 2; Westw. Arc. Ent. ii. pl. 79. f. 2.

Hatsiega.

PAPILIO MEGARUS.

Papilio megarus, Westwood, Arc. Ent. ii. pl. 72. f. 2 (1845).

Houngduran source.

PAPILIO ONPAPE, n. sp.

Differs from specimens of Himalayan *P. panope* Linn. (Cram. Pap. Exot. iv. pl. 295. f. E, F) in having comparatively shorter wings, smaller and less-prominent spots on the fore wing, smaller marginal lunules, and much shorter dentate submarginal streaks on the hind wing.

Expanse $3\frac{6}{8}$ inches.

Hatsiega; Houngduran source; Naththoung. In coll. J. Wood-Mason and F. Moore.

PAPILIO PAMMON.

Papilio pammon, Linn. Syst. Nat. i. 2, p. 746 (1767).

P. polytes, Linn. Syst. Nat. i. 2, p. 746.

Ahsown, 2000 feet; Meetan, 3000 feet (March); Taoo, 3000–5000 feet (March).

PAPILIO ARISTOLOCHIÆ.

Papilio aristolochiæ, Fabr. Syst. Ent. p. 443 (1775).

P. diphilus, Esper, Ausl. Schmett. pl. 40 B. f. 1.

Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

PAPILIO PHILOXENUS.

Papilio philoxenus, Gray, Zool. Misc. p. 32 (1831); Lep. Ins. Nepal, p. 5, pl. 2.

Moulmein to Meetan; Moolai to Moolat, 4500 feet.

PAPILIO DOUBLEDAYI.

Papilio doubledayi, Wallace, Trans. Ent. Soc. 1865, p. 42.

Moulmein to Meetan.

PAPILIO HELENUS.

Papilio helenus, Linn. Syst. Nat. i. 2, p. 745; Cram. Pap. Exot. ii. t. 153. f. A, B.

Hatsiega: Moolai to Moolat, 4500 feet.

PAPILIO MAHADEVA, n. sp. (Plate LI. fig. 1.)

Male. Allied to *P. castor*, but with shorter hind wings, which are of the same form as in *P. panope*. Upperside dark brown, nemerously covered with minute ferruginous scales; fore wing with a marginal series of very small white lunular spots, one between

each vein; hind wing with a discal series of seven short conical yellowish-white spots, a submarginal series of narrow dentate lunules, and a marginal very narrow lunular line, one between each vein. Underside paler, more numerously covered with ferruginous scales; the markings as above; the fore wing also having a second marginal series of very small white spots, and a spot at the end of the cell.

Expanse 4 inches.

Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

A specimen, labelled "Eastern Bengal," from Mr. A. Grote's collection, of what I believe to be the female of *P. mahadeva*, differs from that sex of *P. castor* in the fore wings having very small and less-distinct submarginal white spots, no spot at the end of the cell, and no white speckles between the discal interspaces; the hind wings on both sides also have the discal streaks shorter and confined to the middle of the wing, there being none either at the base or in the cell, thus forming a transverse medial band similar in position to that of the male above described; the submarginal dentate marks are less defined.

PAPILIO ANDROGEOS.

Papilio androgeos, Cram. Pap. Exot. i. pl. 91.

Ahsown, 2000 feet; above Ahsown.

PAPILIO ZELEUCUS.

Papilio zeleucus, Hewitson, Exot. Butt. iii. *Pap.* pl. 8. f. 24, 25 (1865).

Moulmein to Meetan.

PAPILIO SARPEDON.

Papilio sarpedon, Linn. Syst. Nat. i. 2, p. 747 (1767).

Hatsiega; Houngduran source.

PAPILIO AGAMEMNON.

Papilio agamemnon, Linn. Syst. Nat. i. 2, p. 748 (1767).

Moulmein to Meetan; Hatsiega; Houngduran source.

PAPILIO ANTIPHATES.

Papilio antiphates, Cram. Pap. Exot. i. t. 72. f. A, B (1779).

Houngduran source.

LEPTOCIRCUS VIRESCENS.

Leptocircus virescens, Butler, Catal. Fabr. Lep. B. M. p. 259 (1870).

Ahsown; Moulmein to Meetan; Houngduran source; Moolai, 3000–6000 feet.

Fam. HESPERIDÆ.

ISMENE BENJAMINI.

Hesperia benjamini, Guér. Deless. Voy. Inde, ii. p. 79, pl. 22. f. 2 (1843).

Above Ahsown.

ISMENE DRUNA.

Ismene druna, Moore, Proc. Zool. Soc. 1865, p. 784; Hewitson, Exot. Butt. iv. *Hesp.* pl. 2. f. 26.

Taoo, 3000–5000 feet.

TAGIADES PRALAYA.

Tagiades pralaya, Moore, Proc. Zool. Soc. 1865, p. 779.

Ahsown.

TAGIADES MEETANA, n. sp. (Plate LIII. fig. 1.)

Male. Allied to *T. obscurus*, Mabille, from Java: fore wing above similar: hind wing differs in the marginal area of the anal angle being only slightly white-speckled between the veins; the cilia below it dark brown with a very narrow whitish inner line; on the underside there is less white, and the black border more lengthened and prominent, the cilia also being brown.

Expanse $1\frac{6}{8}$ inch.

Meetan, 3000 feet (April). In coll. J. Wood-Mason.

ASTICTOPTERUS DIOCLES.

Nisoniades diocles, Moore, Proc. Zool. Soc. 1865, p. 787.

Meetan, 3000 feet.

ASTICTOPTERUS SUBFASCIATUS, n. sp.

Male and Female. Upperside uniform vinous-brown. Underside—fore wing with a short vinous-grey streak and two small ochreous-grey spots from the apex, three small ochreous-grey spots obliquely from the costa before the apex; hind margin pale ochreous-brown: hind wing with a short, broad, medial and a subbasal vinous-grey band; abdominal margin broadly pale ochreous-brown; some indistinct spots between the bands and at the base also pale ochreous-brown. Palpi, body, and legs beneath pale ochreous-brown.

Expanse $1\frac{4}{8}$ inch.

Ahsown. In coll. J. Wood-Mason.

A specimen of this species from S. India is also in the collection of the British Museum.

PAMPHILA BAMBUSÆ.

Pamphila bambusæ, Moore, Proc. Zool. Soc. 1878, p. 691, pl. 45. f. 11, 12.

Hatsiega.

PAMPHILA MASONI, n. sp. (Plate LII. fig. 5.)

Male. Upperside dark olive-brown; cilia brownish ochreous, palest on hind wing; fore wing with a yellow semidiaphanous sinuous spot at end of the cell, two spots before the apex, and a band of three oblique discal spots, the lower one elongated; hind wing with an opaque yellow discal patch, the basal hairs green. Underside dark ochreous-yellow: fore wing with the basal area black; spots as above,

the lower discal portion broad: hind wing with an indistinct series of marginal and submarginal brown spots. Front of head, palpi, legs, and body beneath yellow.

Expanse $1\frac{4}{10}$ inch.

Hatsiega. In coll. J. Wood-Mason.

PAMPHILA MATHIAS.

Hesperia mathias, Fabr. Ent. Syst. Suppl. p. 433 (1798); Butler, Catal. Fabr. Lep. B. M. pl. 3. f. 6.

Moulmein to Meetan.

HESPERIA MOOLATA, n. sp.

Male and Female. Upperside dark vinous-brown, slightly olive, brown at the base; cilia cinereous-yellow: fore wing with a single small semidiaphanous white spot at lower end of the cell, two smaller spots obliquely before the apex, and three below on the disk, the lowest being the largest and angular; the female with two spots at end of the cell, and a small opaque yellowish spot between lower median branch and submedian vein. Underside brighter-coloured, marked as above, the yellow discal lower spot in female larger.

Expanse $1\frac{1}{2}$ inch.

Ahsown (2000 feet), March. Moolai to Moolat.

This species is allied to *H. kumara*, Moore, from South India, and to *H. cahira* from the Andamans.

PLESIONEURA AURIVITTATA, n. sp. (Plate LIII. fig. 2.)

Male and Female. Upperside dark golden olive-brown: fore wing with a broad oblique golden-yellow discal band curving from middle of the costa to posterior angle, the band semiopaque from the costal vein to lower median branch; a small curved yellow streak composed of three vein-crossed spots before the apex. Cilia of both wings brown. Underside duller brown: fore wing as above: hind wing slightly yellow-speckled, and with a very indistinct yellowish streak at the end of the cell.

Expanse $1\frac{7}{10}$ inch.

Hab. Above Ahsown. In coll. J. Wood-Mason and F. Moore.

Allied to *P. dhanada*, Moore, P. Z. S. 1865, p. 789. Distinguished by the oblique transverse band being very broad throughout and extending to the posterior angle, also in the cilia of hind wing being entirely brown.

PLESIONEURA ALBIFASCIA, n. sp. (Plate LIII. fig. 3.)

Male. Differs from *P. alysos*, Moore, in its narrower fore wing and smaller hind wing; the oblique semidiaphanous white band is shorter and straight, the portion beneath the lower median branch being very small, this part on the underside showing only as a suffused white patch; and there are no subapical spots.

Expanse $1\frac{1}{2}$ inch.

Hatsiega. In coll. J. Wood-Mason.

A specimen of this species, collected by Mr. Buxton, probably in Sumatra, is in my own collection.

ISOTEINON SUBTESTACEUS, n. sp.

Male and Female. Upperside dark olive-brown; cilia cinereous-brown, with a brown inner line and indistinct bars: fore wing with a semidiaphanous spot at end of the cell, a curved series of three subapical contiguous spots, and two larger contiguous spots on the disk. Underside brownish ochreous, grey-speckled: fore wing with the basal area below the cell and the disk fuliginous black; spots as above; male with a black tuft on hind margin: hind wing with a curved discal series of six small white spots, and four subbasal spots, the two lower of the latter being contiguous, the third at the end of the cell, and the fourth above the cell. Palpi and body beneath ochreous-white; legs brownish ochreous. Allied to *I. atkinsoni*, from Darjiling.

Expanse $1\frac{2}{8}$ inch.

Ahsown. In coll. J. Wood-Mason.

SPHINGES.

Fam. SPHINGIDÆ.

Subfam. MACROGLOSSINÆ.

MACROGLOSSA ORIENTALIS.

Macroglossa orientalis, Butler, Trans. Linn. Soc. x. p. 528 (1876).

Ahsown.

MACROGLOSSA LUTEATA.

Macroglossa luteata, Butler, Proc. Zool. Soc. 1875, p. 241, pl. 37. f. 5.

Ahsown.

Subfam. AMBULYCINÆ.

AMBULYX SUBSTRIGILIS.

Ambulyx substrigilis, Westwood, Cab. Orient. Ent. pl. 30. f. 2.

Taoo, 3000–5000 feet.

BOMBYCES.

Fam. ZYGÆNIDÆ.

Subfam. SYNTOMINÆ.

SYNTOMIS GROTEI.

Syntomis grotei, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 4.

Taoo, 3000–5000 feet, March.

SYNTOMIS SLADENI.

Syntomis sladeni, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 5.

Moolai to Moolat, 4500 feet.

SYNTOMIS ATKINSONI.

Syntomis atkinsoni, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 2.

Above Ahsown; Naththoung to Paboga.

SYNTOMIS LIBERA.

Syntomis libera, Walker, Catal. Lep. Het. B. M. Suppl. p. 78.

Above Ahsown; Meetan, 3000 feet, April.

SYNTOMIS MASONI, n. sp. (Plate LIII. fig. 4.)

Allied to *S. vitreata*, H.-Sch. Lep. Spec. Nov. f. 247. Distinguished by having the hyaline spaces broader, by the space between the lower subcostal and upper median branch being black, and the front of the head white.

Expanse, ♂ $1\frac{7}{12}$, ♀ $1\frac{9}{12}$ inch.

Moolai, 3000–6000 feet; Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

SYNTOMIS DISRUPTA, n. sp. (Plate LIII. fig. 5.)

Similar to *S. divisa*, Walker. Differs in its more pointed fore wing, the hyaline spaces extending throughout to the exterior margins, the black borders being narrower.

Expanse $1\frac{1}{2}$ inch.

Moolai, 3000–6000 feet; Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

SYNTOMIS BERINDA, n. sp. (Plate LIII. fig. 8.)

Allied to *S. fenestrata* (H.-Sch. Lep. Spec. Nov. f. 270). Smaller, the hyaline spots on fore wing shorter, those on the hind wing narrower and pale orange-colour. Front of head, collar, a spot on tegulæ, and a spot on hind part of thorax orange-red; the orange bands on abdomen narrow; anal segment black; tarsi with a white band.

Expanse, ♂ $1\frac{1}{10}$, ♀ $1\frac{3}{10}$ inch.

Ahsown, 2000 feet; above Ahsown.

SYNTOMIS ALBIFRONS, n. sp. (Plate LIII. fig. 6.)

Allied to *S. diaphana*, Kollar, and *S. melas*, Walker. Dark purple-black: fore wing with the basal area of the cell, five large elongated discal spots, a small spot between the two lower median veins (obsolete in some specimens), and a narrow indented space from the base above the submedian vein hyaline: hind wing with three short hyaline spots, the outer small, and in some specimens obsolete: front of head, collar above, and four streaks down the thorax white; an orange band on hind part of thorax; abdomen glossy greyish blue, with an orange band on the first and fifth segments, and a lateral band on third and fourth segments; legs slaty blue.

Expanse $2\frac{2}{10}$ inches.

Above Ahsown; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Fam. Chalcosiidæ.

Retina rubrivitta.

Retina rubrivitta, Walker, Catal. Lep. Het. B. M. ii. p. 439 (1854).

Moolai to Moolat, 4000–5000 feet.

Histia papilionaria.

Gynautocera papilionaria, Guérin, Mag. Zool. 1836, p. 12.

Moolai, 3000–6000 feet.

Fam. Euschemidæ.

Euschema militaris.

Phalæna militaris, Linn. [Cram. Pap. Exot. i. pl. 29. f. B].

Moolai, 3000–6000 feet; Moolai to Moolat, 4500 feet.

Euschema excubitor, n. sp.

Male and Female. Differs from *E. militaris* in its much smaller size and more angular outer margin of hind wing; the basal markings are linear and very narrow, those on the hind wing smaller, the discal zigzag band and marginal marks also very narrow, the submarginal spots much smaller, and continuing in a separated series to the subcostal branch.

Expanse $2\frac{3}{5}$ to $2\frac{5}{8}$ inches.

Taoo, 3000–5000 feet, March; Houngduran source. In coll. J. Wood-Mason.

This species is also an inhabitant of the Khasia hills.

Euschema aurilimbata, n. sp.

Allied to *E. malayana*, Guér. Deless. Voy. l'Inde, pl. 23. f. 2, from the Malay coast.

Male pale blue: fore wing with the bands broad and partly confluent: hind wing with the marginal area beyond the zigzag band, and the abdominal border, bright chrome-yellow. Abdomen at base above, tufted sides, body beneath, and legs chrome-yellow.

Expanse $3\frac{1}{4}$ inches.

Ahsown. In coll. J. Wood-Mason.

Euschema horsfieldi.

Euschema horsfieldi, Moore, Catal. Lep. Mus. E.I. C. ii. p. 334, pl. 8A. f. 7.

Ahsown, 2000 feet; Moolai, 3000–6000 feet.

Fam. Nyctemeridæ.

Nyctemera latistriga.

Nyctemera latistriga, Walker, Catal. Lep. Het. B. M. ii. p. 397 (1854).

Ahsown.

PITASILA MOOLAICA, n. sp. (Plate LIII. fig. 10.)

Male and Female. Smaller than *P. varians* (*Nyctemera varians*, Walker); markings similar, those on fore wing narrower and disconnected, the transverse bands broken; and there is also a small white spot at the extreme apex of the wing; those on the hind wing are also smaller.

Expanse 2 inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Fam. LITHOSIIDÆ.

ANAGNIA SUBFASCIATA.

Anagnia subfasciata, Walker, Catal. Lep. Het. B. M. ii. p. 446 (1854).

Ahsown, 2000 feet; Moolai to Moolat, 4500 feet.

PERIDROME ORBICULARIS.

Peridrome orbicularis, Walker, Catal. Lep. Het. B. M. ii. p. 445 (1854).

Aganopis subquadrata, H.-Sch. Lep. Spec. Nov. p. 70, f. 501 (1856).

Above Ahsown; Taoo, 3000–5000 feet.

DAMALIS PLAGINOTA.

Damalis plaginota, Butler, Trans. Ent. Soc. 1875, p. 320.

Above Ahsown.

DAMALIS ALCIPHRON.

Phalæna alciphron, Cramer, Pap. Exot. ii. pl. 133. f. E.

Moulmein to Meetan; Moolai to Moolat, 4500 feet.

HYPSA SUBSIMILIS.

Hypsa subsimilis, Walker, Catal. Lep. Het. B. M. Suppl. p. 212 (1864).

Ahsown.

NEOCHERA MARMOREA.

Neochera marmorea, Walker, Catal. Lep. Het. B. M. vii. p. 1674 (1856).

Above Ahsown; Taoo, 3000–5000 feet; Moolai, 3000–6000 feet.

ŒONISTIS ENTELLA.

Phalæna entella, Cramer, Pap. Exot. iii. pl. 208. f. D.

Moulmein to Meetan.

Fam. ARCTIIDÆ.

ATTATHA, n. g.

Allied to *Euplagia* (*E. hera* of Europe). Fore wing elongated, narrow; costa straight; apex bluntly angular; exterior margin ob-

lique, angle convex; posterior margin convex at base. Hind wing oval, exterior margin very convex. Venation similar to that of *E. hera*. Body elongated; abdomen extending beyond hind wing: antennæ slender, minutely setose. Legs long, femora and tibia slightly pilose. Palpi long, slender, porrect.

ATTATHA REGALIS.

Hypercompa regalis, Moore, P. Z. S. 1872, p. 575, pl. 33. f. 7.

Meetan, 3000 feet, March.

Fam. LIPARIDÆ.

ARTAXA VARIANS.

Artaxa varians, Walker, Catal. Lep. Het. B. M. iv. p. 796 (1855).

Ahsown.

PERINA BASALIS.

Perina basalis, Walker, Catal. Lep. Het. B. M. iv. p. 966 (1855).

Above Ahsown.

Fam. LASIOCAMPIDÆ.

DREATA TAOOENSIS, n. sp. (Plate LIII. fig. 7.)

Allied to *D. petola*, Moore, Catal. Lep. Mus. E.I. C. ii. pl. 10 *a*. f. 2, from Java.

Male. Upperside ochreous-grey; three medial transverse very indistinct dusky lunular lines, a slightly darker discal line and a narrow outer sinuous line, with brighter interspace between the two lines, the point between the two lower median branches only with dusky centre. Underside as above.

Expanse 3¼ inches.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

TRABALA VISHNU.

Gastropacha vishnu, Lefebvre, Zool. Journ. iii. p. 207 (1827).

Taoo, 3000–5000 feet.

NOCTUES.

Fam. OPHIDERIDÆ.

POTAMOPHORA MANLIA.

Phalæna manlia, Cram. Pap. Exot. pl. 92. f. A.

Above Ahsown.

Fam. EREBIDÆ.

ARGIVA HIEROGLYPHICA.

Phalæna hieroglyphica, Drury, Exot. Ins. ii. pl. 2. f. 1.

Moulmein to Meetan.

ARGIVA CAPRIMULGUS, Fab.

Phalæna caprimulgus, Fab. (Guén. Noct. iii. p. 180).

Moolai, 3000–6000 feet.

NYCTIPAO CREPUSCULARIS.

Phalæna crepuscularis, Linn. (Clerck, Icones, pl. 53. f. 1).
Meetan, 3000 feet, April.

Fam. HYPOPYRIDÆ.

SPIRAMA HELICINA.

Speiredonia helicina, Hübn. Zutr. f. 437.
Moolai, 3000–6000 feet.

ENTOMOGRAMMA FAUTRIX.

Entomogramma fautrix, Guén. Noct. iii. p. 204.
Naththoung to Paboga.

Fam. OPHIUSIDÆ.

ARTENA SUBMIRA.

Artena submira, Walker, Catal. Lep. Het. B. M. xiv. p. 1389.
Above Ahsown.

FODINA STOLA.

Fodina stola, Guén. Noct. iii. p. 275.
Ahsown; Taoo, 3000–5000 feet.

CALESIA FLABELLIFERA, n. sp.

Smaller than *C. comesa*, Guén. Noct. iii. p. 258; wings somewhat brighter-coloured, the lappet of hairs on fore wing also smaller and composed of shorter hair; fore tarsi densely clothed with black hair.
Expanse $1\frac{5}{8}$ inch.
Ahsown. In coll. J. Wood-Mason.

CALESIA GASTROPACHOIDES.

Calesia gastropachoides, Guén. Noct. iii. p. 258.
Above Ahsown.

PYRALES.

Fam. SPILOMELIDÆ.

ZEBRONIA PLUTUSALIS.

Zebronia plutusalis, Walker, Catal. Lep. Het. B. M. xvii. p. 478.
Ahsown.

Fam. MARGARONIDÆ.

GLYPHODES BIVITRALIS.

Glyphodes bivitralis, Guén. Delt. et Pyral. p. 293.
Houngduran source.

GLYPHODES STOLALIS.

Glyphodes stolalis, Guén. Delt. et Pyral. p. 293, pl. 3. f. 11.
Moulmein to Meetan; Houngduran source; Naththoung to Paboga.

CYDALIMA CONCHYLALIS.

Margarodes conchylalis, Guén. Delt. et Pyral. p. 303, pl. 8. f. 9.
Hatsiega.

PACHYARCHES VERTUMNALIS.

Margarodes vertumnalis, Guén. Delt. et Pyral. p. 309.
Houngduran source; Naththoung to Paboga.

PACHYARCHES MARTHESIUSALIS.

Margaronia marthesiusalis, Walker, Catal. Lep. Het. B. M. xviii. p. 531.
Houngduran source.

SISYROPHORA PFEIFFERÆ.

Sisyrophora pfeifferæ, Lederer, Wien. ent. Monat. vii. p. 399, pl. 13. f. 13.
Moulmein to Meetan; Houngduran source; Naththoung to Paboga.

EUGLYPHIS PROCOPIALIS.

Phalæna procopialis, Cram. Pap. Exot. iv. pl. 368. f. E.
Ahsown, 2000 feet.

Fam. BOTYDÆ.

BOTYS JOPASALIS.

Botys jopasalis, Walker, Catal. Lep. Het. B. M. xviii. p. 652.
Houngduran source.

BOTYS CALDUSALIS.

Botys caldusalis, Walker, Catal. Lep. Het. B. M. xviii. p. 650.
Naththoung to Paboga.

BOTYS VINACEALIS.

Botys vinacealis, Moore, Proc. Zool. Soc. 1877, p. 619.
Moulmein to Meetan; Houngduran source.

BOTYS UNITALIS.

Botys unitalis, Guén. Delt. et Pyral. p. 349.
Moulmein.

GEOMETRES.

Fam. URAPTERIDÆ.

URAPTERYX PODALIRIATA.

Urapteryx podaliriata, Guén. Phal. i. p. 32 (1857).
Above Ahsown.

Fam. Ennomidæ.

Hyperythra limbolaria.

Hyperythra limbolaria, Guén. Phal. i. p. 101, pl. 3. f. 3, 4.
Ahsown.

Hyperythra angulifascia, n. sp. (Plate LIII. fig. 11.)

Male. Upperside purple-grey, traversed by short black strigæ; a broad greenish-grey band crossing both wings, its outer border brown, and angled before the costa and at the middle of hind wing; inner border curved; apex of fore wing with a brown and black patch, and a blackish discal patch on hind wing below angle of the band. Underside pale yellow traversed by several short brown strigæ, crossed by a narrow discal brown line, bordered outwardly with purple-brown; posterior angles of both wings greyish-white; body beneath and legs yellow.

Expanse $1\frac{3}{5}$ inch.

Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

Omiza schistacea, n. sp. (Plate LIII. fig. 12.)

Male. Upperside vinous-grey: fore wing with two zigzag black lines from the costa, terminating across end of the cell; a black speckled spot below the cell: hind wing with a black wavy discal line. Underside bright ochreous-yellow; apex of fore wing purple; antennæ and palpi grey; legs grey above, yellow beneath.

Expanse $1\frac{1}{2}$ inch.

Above Ahsown. In coll. J. Wood-Mason.

Fam. Fidonidæ.

Corymica arnearia.

Corymica arnearia, Walker, Catal. Lep. Het. B. M. xx. p. 231 (1860).

Ahsown.

Tinoleus eburneigutta.

Tinoleus eburneigutta, Walker, Catal. Lep. Het. B. M. iii. p. 621.
Moolai, 3000–6000 feet.

Fam. Palyadæ.

Eumelea rosalia.

Phalæna rosalia, Cramer, Pap. Exot. iv. pl. 368. f. F.
Above Ahsown.

Fam. Macaridæ.

Macaria nora.

Macaria nora, Walker, Catal. Lep. Het. B. M. xxiii. p. 934.
Moolai, 3000–6000 feet.

Fam. Acidalidæ.

Bithia exclusa.

Bithia exclusa, Walker, Catal. Lep. Het. B. M. xxii. p. 320.
Ahsown.

Acidalia attentata.

Acidalia attentata, Walker, Catal. Lep. Het. B. M. xxii. p. 734 (1861).
Ahsown.

Fam. Micronidæ.

Micronia grammearia.

Micronia grammearia, Geyer, Hübn. Zutr. p. 36, f. 761.
Hatsiega; Taoo, 3000–5000 feet; Moolai, 3000–6000 feet.

Micronia aculeata.

Micronia aculeata, Guén. Phal. ii. p. 26, pl. 13. f. 8 (1857).
Moolai, 3000–6000 feet.

Micronia vagata.

Micronia vagata, Moore, Proc. Zool. Soc. 1877, p. 622, pl. 60. f. 18.
Ahsown; above Ahsown; Moolai, 3000–6000 feet.

Fam. Zerenidæ.

Potera, n. gen.

Male. Fore wing somewhat trigonal; costa arched at base; apex convex; exterior margin oblique; costal vein extending to near apex; subcostal vein four-branched, first and second branches before the end of the cell, second bifid, fourth from the end of the cell; discocellulars bent inward, radial from their middle; median vein three-branched; submedian extending to above posterior angle. Hind wing oval; costal vein extending to apex; subcostal vein two-branched from the end of the cell; other veins as in fore wing. Body slender; antennæ minutely pectinated; palpi very small, slender; legs slender, squamose.

Potera marginata, n. sp. (Plate LIII. fig. 9.)

Male. White; cilia black: fore wing with the costal and exterior borders narrowly and irregularly black-bordered; a very large black spot also at the end of the cell, a smaller spot on the disk beyond, another near base of posterior margin, and a curved streak at the posterior angle: hind wing with black marginal line and spots. Body and legs yellow, spotted with black; antennæ brown.
Expanse $1\frac{5}{8}$ inch.
Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Tabular List showing the Geographical Distribution of the Lepidoptera of Tenasserim.

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
PAPILIONES.													
Nymphalidæ.													
DANAINÆ.													
Danais plexippus	*	.	*	*	*	*	..	*	....		*		
—— chrysippus	*	*	*	*	*	*	.	...	....	....	....	*	*
—— melaneus	*	...	...	*	*	...	...	*					
—— tytia	*	..	...	*	*	*							
—— aglea	*	...	*	...	...	*	...	...	....	....	....	...	*
—— vulgaris	*	...	...	...	...	...	...	*	*				
—— septentrionis	*	...	*	*	*	*	...	*	*	....	....	*	*
Salpinx rhadamanthus	*	...	...	*	*								
—— crassa	*	*	...	...	...	...	*						
—— masoni, n. sp.	*												
—— margarita	*	.	...	...	.	...	...	*					
Trepsichrois midamus	*	...	...	...	*	*	...	*	...	*			
Crastia cupreipennis, n. sp.	*												
Stictoplœa grotei	*	...	..	...	.....	.....	...	*					
Euplœa godartii	*	*	...	...	...	*	*						
—— alcathoë	*	...	...	*									
—— limborgii, n. sp.	*												
—— subdita, n. sp.	*												
SATYRINÆ.													
Lethe arcadia	*	...	...	...	...	...	...	...	*				
—— mekara	*	...	...	...	*								
—— rohria	*	...	*	*	*	*	...	...	*				
—— verma	*	...	...	*	*	*							
Melanitis ismene	*	...	...	*	*	*	...	*	*	....	*	*	
—— bela	*	...	...	*	*								
Zethera diademoides, n. sp.	*												
Mycalesis mineus	*	...	...	*	...	...	...	...	...	...	...	*	
—— perseus	*	...	*										
—— blasius	*	...	...	...	...	...	...	*	*	....	...	*	
—— anaxias	*	...	...	*	*	...	...	...	...	...	...	...	*
—— runeka	*	...	*	*	...	*							
Culapa mnasicles	*												
Yphthima methora	*	...	...	*	*								
—— baldus	*	*	*	...	...	...	...	*					
Erites angularis, n. sp.	*												
Elymnias tinctoria, n. sp.	*												
—— vasudeva	*	...	...	*	*								
Dyctis leucocyma	*	...	...	*	*								

Tabular List (continued).

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
NYMPHALINÆ.													
Amathusia phidippus	*	...	...	...	...	...	...	*	*	...	*		
Zeuxidia masoni, n. sp.	*												
Discophora tullia	*	...	...	*	*								
—— zal	*	...	...	*	*	*							
—— necho	*	...	...	...	*	...	...	...	*	...	*		
Æmona lena	*	...	...	...	...	*							
Clerome arcesilaüs	*	...	...	...	...	...	...	...	*				
Xanthotænia busiris	*	...	...	...	...	...	...	*	...	*			
Thaumantis louisa	*												
Cirrochroa surya, n. sp.	*												
Messaras erymanthis	*	*	...	*	...	...	...	*	...	...	...	...	*
Atella sinha	*	...	...	*	*	...	...	*					
Junonia laomedia	*	*	*	*	*	*	...	*	*	...	...	*	*
—— lemonias	*	...	*	*	*	*	...	*	...	...	...	*	*
—— orithyia	*	...	*	*	*	*	...	*	*	...	...	*	*
—— almana	*	...	*	*	...	*	...	...	...	...	...	*	*
Precis iphita	*	...	...	*	*	*	...	*	*	...	...	*	*
Doleschallia pratipa	*	...	...	...	...	...	...	*	...	...	*		
Kallima limborgii, n. sp.	*												
Cyrestis thyodamas	*	...	...	*	*	*	...	...	...	...	...	...	*
—— cocles	*	...	...	...	...	...	*						
—— risa	*	...	...	*	*								
Herona angustata, n. sp.	*												
Penthema darlisa, n. sp.	*												
Parthenos apicalis, n. sp.	*												
Lebadea attenuata, n. sp.	*												
Neptis adara, n. sp.	*												
—— meetana, n. sp.	*												
—— jumba	*	*	...	...	...	...	...	...	...	...	...	*	*
—— adipala	*	...	...	*									
—— plagiosa, n. sp.	*	...	...	*									
Adolias lepidea	*	...	...	*	*	*	...	...	...	...	...	...	*
—— satropaces	*												
—— parvata, n. sp.	*												
—— discispilota, n. sp.	*												
—— jahnu	*	...	...	*	*								
—— taocana, n. sp.	*												
Charaxes marmax	*	...	...	*	*								
—— harpax	*	...	...	...	*								
—— agna, n. sp.	*												
—— desa, n. sp.	*												
—— samatha, n. sp.	*												
Prothoë franckii	*	...	...	...	...	...	...	*	*				
LIBYTHÆINÆ.													
Libythea myrrha	*	...	...	*	*	...	...	...	...	...	...	...	*

Tabular List (continued).

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Sillhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
Erycinidæ.													
Zemeros flegyas	*	...	...	*	*	*	...	...	*				
Taxila fasciata, n. sp.	*												
Abisara neophron	*	...	...	*	*	*							
—— angulata, n. sp.	*												
Lycænidæ.													
Castalius roxus	*	...	...	...	...	...	...	...	*	*	...	...	*
Lampides alexis	*	.	*	*	*	...	...	...	...	...	...	...	*
—— kandarpa	*	...	*	*	...	...	...	...	*	...	...	*	*
—— elpis	*	...	...	...	*	...	...	...	*	...	...	*	*
—— ælianus	*	...	*	*	*	...	...	...	...	...	*	*	*
Hypolycæna lisias	*												
Myrina freja	*	...	...	...	...	...	...	...	*	*	...	...	*
Deudorix suffusa, n. sp.	*												
Thamala miniata, n. sp.	*												
Loxura atymnus	*	*	*										
Amblypodia taooana, n. sp.	*												
Narathura moolaiana, n. sp.	*												
Arhopala nakula	*	...	...	...	...	...	...	*	...	...	*		
—— vihara	*	...	...	...	...	...	...	*	...	...	...	*	*
Surendra quercetorum	*	...	...	*	*	*	...	...	...	...	...	*	
Thaduka multicaudata, n. sp.	*												
Papilionidæ.													
Pierinæ.													
Nychitonia xiphia	*	...	*	*	*	...	...	*	*	...	...	*	
Terias hecabe	*	*	...	*	*	*	...	...	*	...	...	*	
—— silhetana	*	...	*	*	*	*							
—— formosa	*	...	...	*	*	...	...	...	...	...	*		
—— læta	*	...	...	*									
Eronia lutescens	*	...	...	...	...	...	...	...	...	*			
Callidryas catilla	*	*	*	*	*	*	...	*	*	...	*	*	*
—— crocale	*	*	*	*	*	*	...	*	*	...	*	*	*
Hebomoia glaucippe	*	*	...	*	*	*	...	...	...	...	*	...	*
Ixias citrina, n. sp.	*												
—— pallida, n. sp.	*												
—— moulmeinensis, n. sp.	*												
Catophaga neombo	*	...	...	...	...	...	...	...	*	...	...	*	
—— paulina	*	...	*	...	*	...	...	...	*				
—— lagela, n. sp.	*												
Appias lea	*	*											
—— nama	*	...	...	*	*	*	...	...	...	...	*		
—— dapha, n. sp.	*												
—— amba	*												
—— zelmira	*	..	*	*	...	*							
—— vacans	*	*											

Tabular List (continued).

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
BOMBYCES.													
Syntomis grotei	*	...	...	...	...	*							
—— sladeni	*	...	...	...	...	*							
—— atkinsoni	*	...	...	...	*	*							
—— libera	*	...	...	*	...	...	...	*					
—— masoni, n. sp.	*												
—— disrupta, n. sp.	*												
—— berinda, n. sp.	*												
—— albifrons, n. sp.	*												
Retina rubrivitta	*	...	...	*	*								
Histia papilionaria	*	...	...	...	*								
Euschema militaris	*	...	...	...	*	...	...	...	*				
—— excubitor, n. sp.	*												
—— aurilimbata, n. sp.	*												
—— horsfieldi	*	*	...	...	...	...	...	...	*				
Nyctemera latistriga	*	*	...	...	...	...	...	...	...	...	...	...	*
Pitasila moolaica, n. sp	*												
Anagnia subfasciata	*	*	...	*									
Peridrome orbicularis	*	*	...	*	*	...	...	...	*	...	*		
Damalis plaginota	*	...	...	...	*								
—— alciphron	*	...	...	...	...	...	...	...	*	...	...	*	*
Hypsa subsimilis	*	...	...	...	...	...	...	*	...	*			
Neochera marmorea	*	*	...	*	*								
Œonistis entella	*	...	...	...	...	...	...	...	...	...	...	*	*
Attatha regalis	*												
Perina basalis	*	...	*	...	...	...	...	*	...	...	...	*	*
Artaxa varians	*	...	*										
Dreata taooensis, n. sp.	*												
Trabala vishnu	*	...	...	...	*	...	...	...	*	...	...	*	
NOCTUES.													
Potamophora manlia	*	...	...	*	*	...	...	...	*	...	*	*	*
Nyctipao hieroglyphica	*	...	...	*	*	...	...	...	*	...	*	*	*
—— caprimulgus	*	...	...	*	*	...	...	*	...	...	...	...	*
—— crepuscularis	*	*	...	*	*	...	...	...	*	...	*	*	
Spirama helicina	*	...	...	...	...	...	...	*	...	...	...	*	*
Artena submira	*	...	...	...	...	...	...	...	...	...	...	...	*
Entomogramma fautrix	*	...	...	*	*	...	...	...	...	...	*		
Fodina stola	*	...	...	...	*	...	...	...	...	...	...	...	*
Calesia flabellifera, n. sp.	*												
—— gastropachoides	*	...	...	*	...	...	...	...	*				
PYRALES.													
Zebronia plutusalis	*	...	*										
Glyphodes bivitralis	*	...	*	...	...	...	...	...	...	...	...	*	*
—— stolalis	*	...	*	...	*	...	...	...	...	...	...	*	*
Cydalima conchylalis	*	...	*	...	...	...	...	...	...	...	...	*	*

Tabular List (continued.)

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
Pachyarches vertumnalis	*	...	*	...	...	...	...	...	...	...	...	...	* *
—— marthesiusalis	*	...	*	...	...	...	...	...	...	...	...	...	*
Sisyrophora pfeifferæ	*	...	...	...	*								
Euglyphis procopialis	*	...	...	*	*	...	...	...	*				
Botys jopasalis	*	...	*	...	...	...	...	...	...	...	...	*	
—— caldusalis	*	...	...	...	*								
—— vinacealis	*	...	...	...	...	...	...	...	...	...	*		
—— unitalis	*	...	*										
GEOMETRES.													
Urapteryx podaliriata	*	...	*	*									
Hyperythra limbolaria	*	...	*	...	...	...	...	...	...	...	*	...	*
—— angulifascia, n. sp.	*												
Corymica arnearia	*	...	...	*	...	...	...	...	...	*			
Omiza schistacea, n. sp.	*												
Tinoleus eburneigutta	*	...	...	...	*	...	...	...	...	...	...	*	
Eumelea rosalia	*	*	...	*	...	...	...	...	...	...	...	...	*
Macaria nora	*	...	...	*	...	...	...	...	*	...	*	*	
Bithia exclusa	*	...	...	...	...	...	...	...	...	...	*		
Acidalia attentata	*	...	...	...	...	...	...	...	...	...	*	*	
Micronia grammearia	*	...	...	*	*	...	...	...	*				
—— aculeata	*	...	*	...	...	...	...	...	*	...	*	*	*
—— vagata	*	...	...	...	...	...	...	...	...	...	*		
Potera marginata, n. sp.	*												

EXPLANATION OF PLATES LI.–LIII.

Plate LI.

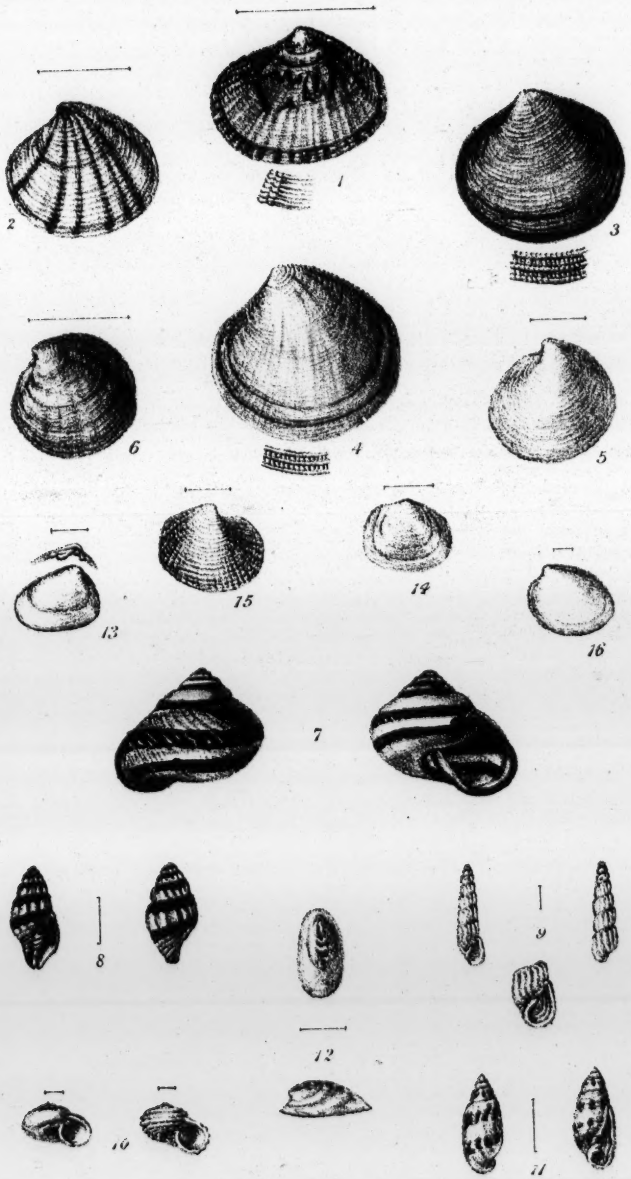
Fig. 1. *Papilio mahadeva*, n. sp., p. 840.
2. *Euplœa limborgii*, n. sp., p. 823.
3. *Zethera diademoides*, n. sp., p. 824.

Plate LII.

Fig. 1. *Taxila fasciata*, n. sp., p. 832.
2. *Adolias discispilota*, n. sp., p. 831.
3. *Adolias parvata*, n. sp., p. 831.
4. *Catophaga lagela*, n, sp., p. 838.
5. *Pamphila masoni*, n. sp., p. 842.
6. *Thamala miniata*, n. sp., p. 834.
7. *Thaduka multicaudata*, n. sp., p. 836.
8. *Deudorix suffusa*, n. sp., p. 834.

Plate LIII.

Fig. 1. *Tagiades meetana*, n. sp., p. 842.
2. *Plesioneura aurivittata*, n. sp., p. 843.
3. —— *albifascia*, n. sp., p. 843.
4. *Syntomis masoni* ♂, n. sp., p. 845.
5. —— *disrupta*, n. sp., p. 845.



G.B.Sowerby lith

NEW SHELLS

Hanhart imp

Fig. 6. *Syntomis albifrons*, n. sp., p. 845.
7. *Dreata taooensis*, n. sp., p. 848.
8. *Syntomis berinda*, n. sp., p. 845.
9. *Potera marginata*, n. sp., p. 852.
10. *Pitasila moolaica* ♂, n. sp., p. 847.
11. *Hyperythra angulifascia*, n. sp., p. 851.
12. *Omiza schistacea* ♂, n. sp., p. 851.

8. Descriptions of six Species of Bivalve Shells in the Collection of Mr. Sylvanus Hanley, F.L.S., and of a *Helix* from the Solomon Islands. By George French Angas, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

(Plate LIV.)

Semele hanleyi, n. sp. (Plate LIV. fig. 1.)

Shell transversely ovate, subequilateral, solid, cream-coloured, tinged with violet below the umbones, with narrow irregular descending white rays towards the base, with several zigzag purplish markings near the centre of the valves; sculptured all over with narrow prominent close-set, somewhat flattened, transverse ridges, which become rather sharp and irregular posteriorly and erectly scabrous at the margin, whilst radiating from the umbones close to the anterior dorsal margin are six close-set ribs, upon which the transverse ridges become nodulous at the points of intersection; umbones prominent, sharp, approximate; posterior dorsal margin nearly straight, anterior one very slightly incurved, ventral margin acute; dorsal area stained with deep purple; valves slightly gaping and flexuous posteriorly; interior of the valves yellow in the middle, stained with rays of violet and rose-colour.

Long. 11, alt. 8, lat. 4 lines.

Hab. Japanese seas (*Belcher*). Collection of Hanley.

A very charming shell; the sculpture of the anterior portion reminding one of certain species of *Psammobia*.

Semele aphrodite, n. sp. (Plate LIV. fig. 2.)

Shell orbicular, nearly equilateral, rather thin, white, with the posterior half of the umbones tipped with rose-colour, from which descend four or five irregular bundles of more or less narrow, faint pink rays, which become a little deeper in colour at the lines of growth and near the base; concentrically sculptured with narrow, thread-like, somewhat distant lamellæ, the spaces between which are crossed with exceedingly fine, close-set, regular hair-like descending striæ; umbones rather tumid, sharp, approximate; dorsal margin posteriorly very slightly arched, anteriorly a little incurved; dorsal area freckled with a few reddish spots; ventral margin strongly arcuate.

Long. 7, alt. 6, lat. 3 lines.

Hab. China seas? (*Belcher*). Coll. Hanley.

An exquisitely sculptured species of great beauty, unique in the collection of Mr. Hanley.

SEMELE ASPASIA, n. sp. (Plate LIV. fig. 3.)

Shell orbicularly ovate, nearly equilateral, subequivalve, moderately thin, yellowish white, concentrically very finely and regularly sculptured with close-set erect frilled laminæ, the interstices being crossed by fine thread-like descending striæ that correspond to the undulations of the transverse frills; concentric ridges smooth and more distant at the umbones; interior of the valves very faintly tinged with flesh-colour.

Long. 12½, alt. 10, lat. 6 lines.

Hab. ——? In coll. Hanley.

This species differs from *S. phryne* in being thinner, more ovate, and less tumid in form, and in the transverse sculpture consisting of elegantly undulating frilled erect laminæ, whilst the interstices between the descending striæ are not squares but narrow parallelograms.

SEMELE PHRYNE, n. sp. (Plate LIV. fig. 4.)

Shell suborbicular, subequilateral, equivalve, somewhat tumid, solid, white, very finely regularly concentrically sculptured with close-set thread-like striæ, the interstices of which are crossed throughout by similar thread-like descending striæ, giving the surface of the valves a beautifully neat and regular reticulated appearance, excepting at the umbones, where the concentric ridges are more distant and the descending striæ finer and nearly obsolete; posterior side very slightly truncate and sinuate below, with a nearly obsolete flattened ridge extending upwards towards the umbo on the right valve; interior slightly tinged with flesh-colour towards the base.

Long. 15, alt. 14, lat. 8 lines.

Hab. ——? In coll. Hanley.

A solid, white, somewhat tumid species, very regularly and finely latticed throughout, the interstices taking the exact form of minute squares.

LUCINA CITRINA, n. sp. (Plate LIV. fig. 5.)

Shell quadrately orbicular, very inequilateral, equivalve, rather thin, primrose-yellow, paler towards the base, concentrically sculptured with very fine thread-like striæ, that become more distant as they approach the base; lunule very small, depressed; umbones tumid; beaks small, incurved; anterior side produced and somewhat flexuous above; interior of valves crenate at the edge, pale yellow.

Long. 4, alt. 3½, lat. 2½ lines.

Hab. ——? Coll. Hanley.

A small species, of a peculiar primrose-yellow colour.

LUCINA ROSEA, n. sp. (Plate LIV. fig. 6.)

Shell elongately orbicular, equivalve, inequilateral, a little tumid,

moderately solid, whitish tinged with pale rose-colour towards the umbones; encircled by close-set, subgranular, spreading, flattened ridges, that become broader and closer towards the base; lunule large, triangular, convex; umbones tumid; beaks small, pointed, incurved; interior of valves pink, the edges crenate within.

Long. 8, alt. 8, lat. 5 lines.

Hab. Natal. In coll. Hanley.

In this pretty shell the sculpture of the valves approaches that of *L. pennsylvanica*; and, as in that species, small fragments of grit and shell are to be found lodging between the overlapping ridges.

HELIX BRENCHLEYI, n. sp. (Plate LIV. fig. 7.)

Shell imperforate, depressedly trochiform, rather thin, obliquely, irregularly, and obscurely striated, yellowish white, with two dark chocolate bands, thickly crossed with white diaphanous zigzag markings encircling the last whorl, the uppermost band the broadest; spire obtusely conical, apex white; whorls 5, flatly convex, sutures impressed, last whorl descending in front, base a little tumid anteriorly; aperture oblique, subrhomboidal; peristome very slightly thickened and expanded, and but little reflexed, the right margin moderately sinuated; columellar margin somewhat flattened and dilated, with a straight abrupt callus; the umbilical region and the inner edge of the lip with the reflected portion brown, immediately behind which is a band of pigment-like deposit of a brilliant orange-colour.

Diam. maj. 11, min. 9, alt. 6½ lines.

Hab. Ysabel Island; Solomon Group. Collected by the late Mr. Brenchley.

A singular shell, having the orange colouring of *H. boivini* behind the outer lip, but differing from that species in its other characters.

9. Descriptions of ten Species of Marine Shells from the Province of South Australia. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

(Plate LIV.)

MITRA TATEI, n. sp. (Plate LIV. fig. 8.)

Shell ovately fusiform, solid, shining, ochraceous, with a broad deep-chocolate-coloured band next below the sutures, and a second similar band towards the lower part of the last whorl; whorls 5½, stoutly and distantly longitudinally ribbed, the ribs becoming obsolete towards the base of the last whorl, which is encircled by three or four transverse ridges; aperture narrowly ovate; outer lip simple; columella 4-plaited.

Long. 3½, lat. 1½ lines.

Hab. Living, in two fathoms water, Surveyor's Point; among shell-sand, Holdfast and Aldinga Bays and Salt Creek.

PARTHENIA GRACILIS, n. sp. (Plate LIV. fig. 9.)

Shell elongately turreted, moderately thin, white, regularly longitudinally ribbed, the interstices crossed with very fine hair-like striæ; whorls 7½, slightly convex, contracted above and below the sutures; sutures strongly impressed; aperture quadrately ovate; outer lip subarcuate, slightly angled above; inner lip with a single sharp tooth about the middle of the columella.

Alt. 2½, diam. ½ line.

Hab. Shell-sand, Glenelg, St. Vincent's Gulf.

CYCLOSTREMA TATEI, n. sp. (Plate LIV. fig. 10.)

Shell widely and deeply umbilicated, orbicular, depressedly turbinate, moderately thin, under the lens very finely transversely striated, shining pearly white; whorls 4, rounded, flattened and slightly excavated next below the suture, with one, or sometimes two, narrow thread-like keels at the upper part, and strongly keeled round the umbilical region; sutures distinct; apex rounded, obtuse; aperture subcircular; lip simple.

Diam. maj. 1¼, min. 1, alt. ¾ line.

Hab. Shell-sand, Holdfast Bay; found alive in the estuary of the Sturt.

The above is the normal condition of the species; but examples occur which are thinner and have a greater number of keels, sometimes as many as seven or eight. At first I was inclined to regard the many-keeled variety as specifically distinct; but on the examination of a large series by Professor Tate, he assures me that the number of keels varies so greatly that it would be impossible to separate them. The thin hyaline examples with many keels are probably younger shells.

BUCCINULUS INTERMEDIUS, n.sp. (Plate LIV. fig. 11.)

Shell elongately ovate, solid, shining, white, painted with two bands of irregular descending brown flames and spots; spire acuminate, pointed at the apex, the same length as the aperture; whorls 6½, encircled by numerous grooved and finely punctured striæ, that become obsolete on the centre of the last whorl; sutures strongly impressed; outer lip simple, thin, non-arcuate; columella with a strong bilobed fold near the base, and a smaller projecting plate above it; inner lip with a broad spreading callus.

Long. 4½, lat. 1½ line.

Hab. Aldinga Bay.

This, the only species of *Buccinulus* as yet discovered in South Australia, is allied to *B. affinis*, A. Ad., from New South Wales, from which it differs somewhat in form, and also in the style of coloration.

NACELLA PARVA, n. sp. (Plate LIV. fig. 12.)

Shell depressedly conical, cap-shaped, semipellucid, nearly smooth,

or with very fine concentric lines of growth, pale horn-colour, with a single row of pale blue spots and crescent-shaped opaque markings extending from the apex centrally, more or less along the outer arc of the shell; apex anterior, recurved, submarginal; aperture narrowly ovate, margin simple, entire; interior pearly white, shining.

Diam. maj. 3, min. $1\frac{1}{2}$, alt. 1 line.

Hab. Holdfast Bay and Aldinga Bays; parasitic on seaweed.

MYSELLA DONACIFORMIS, n. sp. (Plate LIV. fig. 13.)

Shell quadrately cuneate, moderately solid, equivalve, very inequilateral, subventricose, compressed towards the base, white, shining, finely concentrically ridged; dorsal margin slightly arcuate posteriorly, short and abruptly descending anteriorly; ventral margin a little convex; umbones somewhat tumid; beaks distinct, incurved, approximate.

Long. 3, alt. 2, lat. 1 line.

Hab. Holdfast and Aldinga Bays, St. Vincent's Gulf.

In the 'Proceedings' of this Society for 1877, page 176, I gave the diagnosis of the genus *Mysella*, for the reception of a small bivalve from Port Jackson, which I described as *Mysella anomala*. I have subsequently received from Professor Tate one or two examples of the same species from South Australia, together with a second form of the genus, of a more cuneate shape than the type, now described above as *M donaciformis*.

LEPTON AUSTRALIS, n. sp. (Plate LIV. fig. 14.)

Shell quadrately orbicular, compressed, equivalve, nearly equilateral, thin, very slightly gaping at the sides, white, very finely concentrically striated; dorsal margin arched, ventral margin nearly straight; beaks small, produced and acute.

Long. 4, alt. 3, lat. $\frac{1}{3}$ line.

Hab. Glenelg, and Port Creek.

Belonging to the typical form of the genus, with the surface of the valves finely striated but not shagreened.

LUCINA (CODAKIA) TATEI, n. sp. (Plate LIV. fig. 15.)

Shell quadrately ovate, subventricose, moderately solid, subequilateral, white, concentrically ridged, the ridges closer near the umbones, and more distant towards the base, and crossed on both sides with radiating ribs, that become slightly nodulous at the intersections; dorsal margin deeply excavated in front, nearly straight and rapidly descending behind; ventral margin arcuate, rounded in front, forming an obtuse angle where it joins the dorsal excavation; umbones very acute, incurved and approximate.

Long. 4, alt. 3, lat. $1\frac{3}{4}$ lines.

Hab. East side of St. Vincent's Gulf, and Cape Northumberland.

This little species is quite distinct from *L. quadrata*, Angas (P. Z. S. 1877, p. 176), from Port Jackson, although of a somewhat similar form.

NUCULA MICANS, n. sp. (Plate LIV. fig. 16.)

Shell minute, obliquely and triangularly ovate, subventricose, very inequilateral, moderately solid, white, shining, very finely concentrically striated, the striæ occasionally running into each other; dorsal margin somewhat arched posteriorly, short and descending in front; ventral margin moderately arcuate; umbones tumid, smooth, pearly, and approximate.

Long. 1, alt. $\frac{3}{4}$, lat. $\frac{1}{2}$ line.

Hab. Shell-sand, Salt Creek; Glenelg, St. Vincent's Gulf.

Somewhat allied to *Nucula pusilla*, Ang. (P. Z. S. 1877, p. 177), from Port Jackson, but possessing a different style of sculpture.

EXPLANATION OF PLATE LIV.

Fig. 1. *Semele hanleyi*, p. 859.
2. —— *aphrodite*, p. 859.
3. —— *aspasia*, p. 860.
4. —— *phryne*, p. 860.
5. *Lucina citrina*, p. 860.
6. —— *rosea*, p. 860.
7. *Helix brenchleyi*, p. 861.
8. *Mitra tatei*, p. 861.
9. *Parthenia gracilis*, p. 862.
10. *Cyclostrema tatei*, p. 862.
11. *Buccinulus intermedius*, p. 862.
12. *Nacella parva*, p. 862.
13. *Mysella donaciformis*, p. 863.
14. *Lepton australis*, p. 863.
15. *Lucina* (*Codakia*) *tatei*, p. 863.
16. *Nucula micans*, p. 864.

10. A List of additional Species of Marine Mollusca to be included in the Fauna of the Province of South Australia; with Notes on their Habitats and Local Distribution. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

In the year 1865 I published in the 'Proceedings' of this Society a list of all the species of marine Mollusks that had been met with on the shores of the Province of South Australia up to that date, numbering about 231 Gasteropods and 97 Conchifera. Since that period other species have come to light, several of them hitherto only known as inhabiting the New-South-Wales and Tasmanian seaboards; whilst others have proved to be new to science, and have been described by me recently. I am indebted to Professor Ralph Tate and Mr. W. T. Bednall, of Adelaide, for several interesting additions to my list—which includes 54 Gasteropoda, and 21 Conchifera, &c., hitherto unrecorded as occurring in South Australia, thus making a grand total of 403 species.

GASTEROPODA.

1. MUREX ANGASI.

Typhis angasi, Crosse, Journ. de Conch. 1863, p. 86, pl. 1. fig. 2, Port Lincoln (*Bednall*).

2. TRITON (EPIDROMUS) BEDNALLI.

Triton bednalli, Brazier, Proc. Linn. Soc. N. S. W. 1875, p. 6. Guichen Bay (*Bednall*).

3. COMINELLA LACTEUM.

Buccinum lacteum, Reeve, Conch. Icon. pl. 14. fig. 117.
Port Elliot and Port Wallaroo (*Stansbury*).

4. NASSA JACKSONIANA.

Buccinum jacksonianum, Kiener, Mon. Bucc. pl. 19. fig. 73.
Holdfast and Aldinga Bays (*Bednall*); also Port Jackson.

5. NASSA INTERMEDIA.

Nassa intermedia, Dunker, 'Novara' Exp. Moll. tab. 1. fig. 2.
Port Lincoln (*Bednall*); also Port Jackson.

6. AMALDA MARGINATA.

Ancillaria marginata, Lam., Reeve, Conch. Icon. pl. 3. fig. 8.
Port Lincoln; South Coast (*Bednall*). Also Tasmania and New South Wales.

7. MELO MILTONIS.

Melo miltonis, Gray, Grif. An. King. (1833).
Fowler's Bay, to the westward of Port Lincoln.

8. MITRA PICA.

Mitra pica, Reeve, P. Z. S. 1845; Conch. Icon. pl. 31. fig. 247.
Port Elliot; Kangaroo Island (*Bednall*).

9. MITRA LINCOLNENSIS.

Mitra lincolnensis, Angas, P. Z. S. 1878, p. 313, pl. 18. figs. 10, 11.
Port Lincoln, Semaphore Beach; and Salt Creek.

10. MITRA SCHOMBURGKI.

Mitra schomburgki, Angas, P. Z. S. 1878, p. 313, pl. 18. figs. 12, 13.
St. Vincent's Gulf.

11. MITRA TATEI.

Mitra tatei, Angas, P. Z. S. 1878, pl. 54. fig. 8.
Found alive in two fathoms of water, Surveyor's Point; among shell-sand, Holdfast and Aldinga Bays, and Salt Creek (*Tate*).

For *Columella dermestoides*, Kien. (No. 65 in my first list), read *C. lineolata*, Pease. Port Lincoln and Port Elliot.

For *Columella interrupta*, Angas (specific name preoccupied), read *C. angasi*, Brazier. York's Peninsula.

12. MARGINELLA VOLUTIFORMIS.

Marginella volutiformis, Sow. Thes. Conch.
Macdonnell Bay (*Tate*).

13. MARGINELLA TURBINATA.
Marginella turbinata, Sow. Thes. Conch.
Macdonnell Bay; also New S. Wales.

14. CRYPTOSPIRA CYMBALUM.
Cryptospira cymbalum, Tate, Proc. Adelaide Phil. Soc. 1878.
Aldinga. Like *C. ovulum*, with eight plaits on the pillar.

15. HYALINA ALBIDA.
Hyalina albida, Tate, Proc. Adelaide Phil. Soc. 1878.
Marino. Very narrow and white.

16. ERATO BIMACULATA.
Erato bimaculata, Tate, Proc. Adelaide Phil. Soc. 1878.
Minute, yellowish white, with a red spot at each end of aperture.

17. NATICA MAROCHIENSIS.
Natica marochiensis, Lam., Reeve, Conch. Icon. pl. 13. fig. 52.
Very small specimens, living in St. Vincent's Gulf. Subfossil in the Port-Adelaide-Creek limestone (*Tate*).

18. SCALA FRIABILIS.
Scalaria friabilis, Sow., Reeve, Conch. Icon. pl. 7. fig. 52.
Port Lincoln; also Swan River.

19. SCALA (OPALIA) AUSTRALIS.
Scalaria australis, Lam., Sow. Thesaurus, pl. 35. fig. 135.
Aldinga Bay (*Bednall*); also New S. Wales.

20. TEREBRA BRAZIERI.
Terebra brazieri, Angas, P. Z. S. 1871, pl. 1. fig. 15.
Port Elliot (*Bednall*); Brisbane Water, New S. Wales.

21. TEREBRA USTULATA.
Terebra ustulata, Desh. P. Z. S. 1859, p. 294.
Fowler's Bay; Port Elliot (*Stansbury*). Also Tasmania.

22. OBELISCUS BRUNNEA.
Obeliscus brunnea, A. Ad., Sow. Thesaurus, pl. 171. fig. 35.
Syrnola brunnea, A. Ad. P. Z. S. 1862, p. 233.
Port Lincoln.

23. SYRNOLA TINCTA.
Syrnola tincta, Angas, P. Z. S. 1871, pl. 1. fig. 11.
St. Vincent's Gulf; also Port Jackson.

24. ODOSTOMIA EBURNEA.
Odostomia eburnea, Metcalfe, M.S. in Brit. Mus.
Holdfast Bay (*Tate*).
A very small, ovate, ivory-white species.

25. PARTHENIA GRACILIS.

Parthenia gracilis, Angas, P. Z. S. 1878, pl. 54. fig. 9.

Shell-sand, Holdfast Bay (*Tate*).

26. TURBONILLA ACICULARIS.

Turbonilla acicularis, A. Adams.

St. Vincent's Gulf (*Tate*).

27. TURBONILLA FUSCA.

Turbonilla fusca, A. Adams.

Holdfast and Aldinga Bays; Port Lincoln (*Tate*).

28. TURBONILLA HOFMANI.

Turbonilla hofmani, Angas, P. Z. S. 1877, p. 183.

T. nitida, Angas, P. Z. S. 1867, p. 112 (name preoccupied by A. Adams: *T. nitida*, from Japan, Ann. Nat. Hist., vi. p. 419 (1860).

T. angasi, Tenison-Woods, Proc. Roy. Soc. Tasmania, Mar. 13, 1877.

Holdfast and Aldinga Bays (*Tate*); also Port Jackson.

29. TRIVIA AUSTRALIS.

Cypræa australis, Lam.; Sow. Conch. Illus. fig. 29.

Fowler's Bay; Cape Northumberland (*Tate and Bednall*). Also New-South-Wales coast.

30. DIALA IMBRICATA.

Diala imbricata, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1862.

Shell-sand, Glenelg and Aldinga Bay (*Tate*).

31. DIALA VARIA.

Diala varia, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1861.

Between tide-marks, under stones, Aldinga Bay (*Tate*).

32. DIALA PICTA.

Diala picta, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1861.

St. Vincent's Gulf; and Wallaroo, Spencer's Gulf (*Tate*).

33. RISSOINA NIVEA.

Rissoina nivea, A. Adams, P. Z. S. 1851, p. 265.

Port Lincoln.

34. TROCHITA CALYPTRÆFORMIS.

Trochus calyptræformis, Lam. Anim. sans Vert. vii. p. 627.

Crepidula tomentosa, Quoy et Gaim.

On *Pinnæ*, Holdfast and Aldinga Bays (*Bednall*). Also New S. Wales.

35. TRIPHORIS SCITULUS.

T. scitulus, A. Adams.

St. Vincent's Gulf (*Bednall*).

36. AMATHINA TRICARINATA.

Amathina tricarinata, Gray, Woodward's Manual, pl. 11. fig. 19.
Found dead on the beach at Port Lincoln.

37. CYCLOSTREMA TATEI.

Cyclostrema tatei, Angas, P. Z. S. 1878, pl. 54. fig. 10.
Shell-sand, Holdfast Bay; alive in the estuary of the Sturt (*Tate*).

38. SCHISMOPE ATKINSONI.

Scissurella atkinsoni, Tenison-Woods, Proc. Roy. Soc. Tasmania, 1876.
Holdfast and Aldinga Bays (*Tate*).

39. FISSURELLIDÆA SCUTELLA.

Fissurella scutella, Gray, Brit.-Mus. Cat. (*Fissurella*), No. 42; Sow. Thes. Conch. pl. 9. fig. 207 (*Trapezina*).
Guichen and Holdfast Bays (*Bednall*). Also Tasmania, New South Wales, and Cape of Good Hope.

40. MACROSCHISMA TASMANIÆ.

M. tasmaniæ, Gray.
South-east coast (*Bednall*); Tasmania (*T. Woods*).
Emarginula tasmaniæ, Sow., and *E. tenuicostata*, Sow., are regarded, and, I believe, rightly, by Rev. Tenison-Woods as varieties of *E. rugosa* of Quoy and Gaimard.

41. EMARGINULA DILECTA.

E. dilecta, A. Adams, P. Z. S. 1851.
St. Vincent and Spencer's Gulfs.

42. NACELLA PARVA.

Nacella parva, Angas, P. Z. S. 1878, pl. 54. fig. 12.
Holdfast and Aldinga Bays, parasitic on seaweed (*Tate*).

43. DENTALIUM OCTAGONUM?

D. octagonum, Lam.
Henley Beach.

44. CADULUS ACUMINATUS?

C. acuminatus, Desh., M.S. in coll. Cuming.
Holdfast and Aldinga Bays (*Tate*); also Port Jackson.

45. LEPIDOPLEURUS ANTIQUUS.

L. antiquus, Reeve, Conch. Icon. pl. 25. fig. 169.
Aldinga Bay, and Marina (*Bednall*); also Port Jackson.

46. CHITON SICULOIDES.

Chiton siculoides, Carpenter.
Port Lincoln (*Bednall*).

47. Buccinulus intermedius.

B. intermedius, Angas, P. Z. S. 1878, p. 869, pl. 54. fig. 11.
Aldinga Bay (*Tate*).

48. Tornatina fusiformis.

T. fusiformis, A. Ad., Sow. Thes. Conch. pl. 121. fig. 37.
Glenelg Beach (*Bednall*); also Port Jackson and Port Stephen, New S. Wales.

49. Volvula rostrata.

V. rostrata, A. Adams, Sow. Thes. Conch. pl. 125. fig. 154.
Holdfast Bay (*Tate*).

50. Cylichna pygmæa.

C. pygmæa, A. Adams, Sow. Thes. Conch. pl. 125. fig. 150.
Holdfast Bay (*Tate*).

51. Atys exigua.

Atys exigua, A. Adams, Sow. Thes. Conch. pl. 125. fig. 129.
Holdfast Bay (*Tate*).

52. Alexia meridionalis.

A. meridionalis, Brazier, M.S.
Port-Adelaide Creek (*Bednall*).

53. Marinula xanthostoma.

M. xanthostoma, H. & A. Adams, P. Z. S. 1854, p. 35.
York's Peninsula, Aldinga, &c. (*Bednall*).

54. Siphonaria albida.

Siphonaria albida, Angas, P. Z. S. 1878, p. 869, pl. 18. figs. 14, 15.
Port Lincoln.

CONCHIFERA.

55. Humphreyia strangei.

Aspergillum strangei, A. Adams, P. Z. S. 1852, p. 91, pl. 15. fig. 5.
St. Vincent's Gulf (*Bednall*). Also Port Jackson, New S. Wales (*Angas*); Tasmania (*T. Woods*).

56. Gastrochæna tasmanica.

G. tasmanica, Tenison-Woods.
Burrowing in limestone forming the bed of Port-Adelaide Creek; also on *Chamæ*; and in the incrusted growth of *Pinnæ*, St. Vincent's Gulf (*Tate*).

57. Corbula nasuta.

Corbula nasuta, Sow. P. Z. S. 1833, p. 35.
Holdfast and Aldinga Bays (*Tate*); also New S. Wales.

58. Donax sordidus.

D. sordida, Reeve, Conch. Icon. pl. 4. fig. 32.

Port Lincoln.

59. Mysella anomala.

Mysella anomala, Angas, P. Z. S. 1877, p. 176, pl. 26. fig. 22.

Holdfast and Aldinga Bays (*Tate*); also Port Jackson, New S. Wales.

60. Mysella donaciformis.

Mysella donaciformis, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 13.

St. Vincent's Gulf (*Tate*).

61. Tapes flabagella.

Tapes flabagella, Desh., Reeve, Conch. Icon. pl. 13. fig. 66.

Aldinga and Holdfast Bays (*Tate*); also New South Wales.

62. Chione (Marcia) lævigata.

Venus lævigata, Sow. Thes. Conch. pl. 159. figs. 156–8.

Port-Adelaide Creek (*Bednall*). New S. Wales, Victoria, and Tasmania.

63. Tivela undulosa.

Venus undulosa, Lam. Anim. sans Vert. vi. p. 370.

Venus variabilis, Sow. Thes. Conch. *Venus*, pl. 158. figs. 142–6.

Semaphore Beach, Guichen Bay, and Port Lincoln (*Bednall*).

64. Cardium pulchellum.

C. pulchellum, Reeve, Conch. Icon. pl. 8. fig. 42.

Dredged in St. Vincent's Gulf (*Tate*); also Port Jackson and Tasmania. (Very small specimens.)

65. Lucina tatei.

Lucina (*Codakia*) *tatei*, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 15.

East side of St. Vincent's Gulf, and Cape Northumberland (*Tate*).

66. Loripes ovum.

Lucina ovum, Reeve, Conch. Icon. pl. 5. fig. 21.

Holdfast Bay and Salt Creek (*Tate*); also Botany Bay, New S. Wales.

67. Lasea australis.

Poronia australis, Souv. Journ. de Conch. 1863, pl. 12. fig. 8.

Under stones, Aldinga and Holdfast Bays, Cape Northumberland, and Wallaroo. Common in Tasmania, and also in New S. Wales.

68. Lepton australis.

Lepton australis, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 14.

Glenelg and Port Creek (*Tate*).

69. Crenella barbata.

Modiolaria barbata, Angas, P. Z. S. 1867, p. 911, pl. 44. fig. 12.

St. Vincent's Gulf &c.; also Botany Bay, New S. Wales.

70. Trigonia margaritacea.

Trigonia margaritacea, Lam., Reeve, Conch. Icon. pl. 1. fig. 3.

Port Lincoln; dead valves washed upon Semaphore Beach (*Bednall*). Also Tasmania.

71. Pectunculus laticostatus.

P. laticostatus, Quoy et Gaim. Voy. de l'Astrol.; Reeve, Conch. Icon. pl. 2. fig. 8 *a*, *b*.

Cape Jervis; and Hallet's Cove, St. Vincent's Gulf (*Tate*); Badger Island, Bass's Straits (*Tate*). New Zealand.

72. Limopsis macgillivrayi.

Limopsis macgillivrayi, A. Ad. in Coll. Cuming.

Guichen Bay (*Bednall*). Semifossil at McDonnell Bay (*Tate*).

73. Nucula micans.

Nucula micans, Angas, P. Z. S. 1878, p. 864, pl. 54. fig. 16.

Shell-sand, St. Vincent's Gulf (*Tate*).

74. Placunanomia (Monia) ione.

Placunanomia ione, Gray, P. Z. S. 1849, p. 123.

Henley Beach; Marino (*Bednall*). Common in New South Wales.

75. Kraussia lamarckiana.

Kraussia lamarckiana, Davidson, P. Z. S. 1852, p. 80, pl. 14. figs. 22, 23.

St. Vincent's Gulf (*Tate*). Common in N. S. Wales and Tasmania, also New Zealand.

11. Notes on *Myxopoda aurita*, Miln.-Edw.

By G. E. Dobson, M.A., M.B., &c.

[Received October 21, 1878.]

Among the many valuable specimens lately added to the collection of the Muséum d'Histoire Naturelle at Paris, perhaps the most remarkable is that of a very peculiar species of Bat from Madagascar, described by M. Alphonse Milne-Edwards[1] under the appropriate name of *Myxopoda*[2] *aurita*.

During a short visit to Paris last month I was enabled, through the kindness of M. Milne-Edwards, to examine the type of this most interesting species, of which the following is a description.

[1] In Bull. Soc. Philom. de Paris, June 22, 1878.

[2] *μύξα*, mucus; *πούς*, pes.

Crown of the head but slightly raised above the face-line; muzzle obliquely truncated, in general form closely resembling that of the species of the genus *Chilonycteris*; for the nostrils open widely apart by similar circular sharply defined margins, and the lower lip is also papillate and reflected outwards, though not so broadly, and it has not a thin free margin; the obtuse extremity of the rather long muzzle projects in front considerably beyond the lower lip. Ears very large, much longer than the head, in general outline like those of *Vespertilio murinus*; but the inner margin commences in a small lobe projecting downwards; in the usual position of the tragus, or slightly in front of it, there is an irregularly square lobe continuous above with the keel of the ear-conch; opposite this, on the outer side of the concave surface of the conch, is a mushroom-shaped process consisting of a short stalk supporting a broad flat reniform expansion; the outer margin of the conch terminates near the angle of the mouth.

Thumb with an ill-developed claw; but the whole of the inferior surface of its metacarpal and phalangeal bones supports a large flat horseshoe-shaped pad, more than $0''{\cdot}2$ inch in diameter, of which the circular margin is directed forwards and slightly notched in front; this pad, though considerably larger than that occupying the same position in *Thyroptera tricolor*, does not form nearly so perfect a clinging-organ as in that species; for it is quite sessile, without a trace of a peduncle, and its surface is flat, like the thumb-pad of *Vesperugo pachypus*, with which it is evidently homologous. The feet have also adhesive pads; but, while resembling closely those of the thumbs in structure and external form, they differ in being much smaller, and so agree rather with those of *Thyroptera tricolor* than with *Vesperugo pachypus*.

The metacarpal bone of the index finger is well developed, being nearly as long as that of the third finger, but there are no distinct phalanges; the third finger has *three* phalanges, of which the first and second are nearly equal in length.

The tail projects beyond the posterior margin of the interfemoral membrane as in *Thyroptera tricolor*, but to a much greater extent, the free portion being nearly equal to the tibia in length; the calcanea are almost as long as the tibiæ; the very narrow post-calcaneal lobe is notched or toothed near the foot.

As in *Thyroptera tricolor*, the toes are united as far as the base of the claws, and have each two phalanges, and the wing-membrane extends almost to the base of the claws.

Dentition.—Inc. $\frac{2-2}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$.

Upper incisors short, in pairs, placed close to the canines; the outer incisor, on each side, small, conical, and acutely pointed, but much larger than the inner one, which lies close to it and is hardly visible without the aid of a lens; lower incisors short and blunt, in the direction of the jaws; first and second upper premolars very short, the third exceeding the molars in vertical extent; second lower premolar minute, in the tooth-row, the first premolar slightly

smaller than the third; molars acutely tubercular, with W-shaped cusps.

Length (of the type specimen, an adult male), head and body 2″·3; tail 1″·9, tail free from membrane 0″·6; head 0″·85; ear 1″·3, tragus 0″·25; forearm 1″·85; thumb 0″·3; third finger—metacarp. 1″·5, 1st ph. 0″·7, 2nd ph. 0″·75, 3rd ph. 0″·55; fifth finger—metacarp. 1″·5, 1st ph. 0″·5, 2nd ph. 0″·5; tibia 0″·7; calcaneum 0″·6; foot 0″·3.

Certain peculiarities in the structure of this very remarkable species recall similar peculiarities in *Thyroptera tricolor*, and have evidently resulted from adaptation to the same purpose. Thus in these two species alone are the toes united to the base of the claws, and in them alone, among all known species of Bats (except the *Phyllorhininæ*), have the toes an equal number of phalanges; they also, in the possession of a third phalanx in the middle finger, differ from all the species of Vespertilionidæ, and from those of the allied families. This species, however, differs remarkably from *Thyroptera tricolor* in the structure of the adhesive disks, in the presence of a well developed metacarpal bone of the second finger, in the form of the head and ears, and in dentition, and must undoubtedly be considered the type of a distinct genus of Vespertilionidæ.

As remarked above, the adhesive pads are evidently less perfect as clinging-organs than the corresponding parts in *Thyroptera tricolor*, and occupy, in this respect, an intermediate position between those of that species and of *Vesperugo pachypus*.

It is probable that this species (in common with the few other species of Bats provided with such accessory clinging-organs) uses the adhesive pads in sustaining its hold on the smooth hard stems and leaves of palms and of other hard-wooded trees[1].

12. Notes on recent Additions to the Collection of Chiroptera in the Muséum d'Histoire Naturelle at Paris, with Descriptions of New and Rare Species. By G. E. Dobson, M.A., M.B., &c.

[Received October 28, 1878.]

Through the kindness of M. Alphonse Milne-Edwards I have lately been permitted to examine and describe the valuable additions to the collection of Chiroptera in the Muséum d'Histoire Naturelle, made by various collectors since my last visit to Paris in 1876.

The collections, from which the specimens which form the subject matter of this paper were derived, were made chiefly in the islands of New Guinea and New Caledonia, in Siam, in Africa and Madagascar, and in Central America. The species may therefore

[1] See my 'Catalogue of the Chiroptera in the Collection of the British Museum,' p. 444; also 'Nature,' vol. xviii. p. 585.

be conveniently arranged for description and remarks under the heads of the four zoological regions thus represented.

1. *Australian Region.*

Pteropus germaini, n. sp.

Ears shorter than the muzzle, concealed by the long fur of the head, triangular, obtusely pointed, thinly clothed throughout with soft hairs. Fur long and woolly, like that of *Pt. aneiteanus*; on the back long like that of the head, directed backwards. Humerus and forearm rather thinly covered with straight fur, like that of the back. The legs are clothed with long fur which extends to the backs of the feet; the margin of the wing membrane above, almost as far outwards as the extremity of the fifth finger, is clothed with straight appressed hairs; the posterior margin of the narrow interfemoral membrane is quite concealed.

Face in front of and immediately above the eyes light greyish brown; head and the whole inferior surface of the body dark blackish brown, interspersed with several shining greyish hairs, the shoulders and back darker, the rump and legs greyer; upper surface of the neck and shoulders pale yellow, with reddish extremities.

Teeth simple, like those of *Pt. medius*; the first upper premolar small, scarcely raised above the level of the gum, and occupying the centre of the small space between the canine and second premolar; last upper molar slightly larger than the first lower premolar, and about the size of the last lower molar.

Length (of a not quite adult ♀), head and body about 6″; head 2″·3; ear 0″·8; forearm 4″·7; thumb 2″·3; third finger—metacarp. 3″, 1st ph. 2″·5, 2nd ph. 3″·5; fifth finger—metacarp. 3″, 1st ph. 1″·5, 2nd ph. 1″·35; tibia 2″·2; foot 1″·7.

Hab. New Caledonia.

This species resembles externally, to some extent, *Pt. aneiteanus*; but the very different form of the teeth at once distinguishes it. From *Pt. vetulus*, inhabiting the same islands, it is distinguished by the completely different colour of the fur, as well as by the absence of transverse basal ridges in the molars and premolars.

The food of this species appears to consist, in part at least, of figs, as I found portions of these fruits in the mouth of the typical specimen.

At the request of M. Milne-Edwards, who pointed out to me this new species, I have much pleasure in connecting with it the name of its discoverer, M. Germain.

Pteropus vetulus, Jouan.

Besides the type, the Museum possesses several specimens of this species, both male and female, from New Caledonia. These all more or less resemble the type specimen in the colour and distribution of the fur; and the few differences observable are unimportant.

Hab. New Caledonia; Loyalty Isles.

PTEROPUS KERAUDRENI, Quoy & Gaimard.

The specimens in the collection from New Caledonia have the face, back, and inferior surface of the body of a much darker colour than is usually observed in specimens of this species from other localities, and they agree in this respect closely with the types of *Pteropus vanicorensis*, Q. & G., which, as I have indicated in my 'Catalogue of the Chiroptera,' is evidently a variety only of *Pt. keraudreni*.

Hab. New Caledonia, and most other islands of the Polynesian subregion. (See my 'Catalogue of Chiroptera,' p. 64.)

PTEROPUS HYPOMELANUS, Temminck.

Several specimens of this species were obtained by M. Laglaize at Amberbaki, New Guinea.

CYNOPTERUS SCHERZERI (Fitzinger).

Several specimens of this species, labelled "N. Guinée, M. Laglaize." With the exception of that very aberrant form *Cynopterus latidens*, described by me from a specimen from Morty Island, this is the first instance of any species of this genus extending beyond the Oriental region. It is strange that this species should extend from the Nicobar Islands to New Guinea; and it is just possible that some mistake may have been made by the collector when labelling the specimens.

HARPYIA CEPHALOTES, Pallas.

An adult specimen from New Guinea, collected by M. Raffray. This is the first example of this species obtained in the above-named locality.

CEPHALOTES MINOR, n. sp.

Not half the size of adult specimens of *C. peroni*, but closely resembling that species in general structure. The wing-membrane is similarly attached only to the central line of the back along the spine, and is also naked from the shoulders backwards; the head and muzzle are of the same shape as in the larger species; but the ears are less pointed.

The feet are much smaller than in very young specimens of *C. peroni*; and the wing-membrane is attached to the outer toe, not to the space between the toes as in that species; it also extends further outwards, terminating opposite the second joint of the next toe.

The teeth are also slightly different: the upper incisors are wider apart; the second upper premolar has not the prominent antero-internal basal cusp observed in *C. peroni*; and the first lower premolar scarcely rises above the gum.

The following Table exhibits the comparative measurements of this species and of *C. peroni*:—

	C. minor.	*C. peronii.*
Length, head and body	4·5	6·0
„ tail	0·6	1·3
„ head	1·6	2·0
„ ear	0·7	1·0
„ forearm	3·2	5·3
„ first finger	1·3	1·5
„ third finger, metacarp.	2·0	3·1
„ „ „ 1st ph.	1·5	2·35
„ „ „ 2nd ph.	1·9	3·4
„ fifth finger, metacarp.	2·0	2·8
„ „ „ 1st ph.	1·1	1·7
„ „ „ 2nd ph.	1·1	1·8
„ tibia	1·1	2·3
„ calcaneum	0·25	0·5
„ foot	0·8	1·2

Hab. Amberbaki, New Guinea.

PHYLLORHINA TRICUSPIDATA, Temminck.

Several specimens obtained by M. Raffray in New Guinea. This is the first recorded instance of this species having been found in that country, which, however, it might be expected to inhabit, as it has been noted from Batchian, Amboyna, Morty, and Duke-of-York Island.

PHYLLORHINA CERVINA, Gould.

Examples of this species from New Guinea, collected by M. Laglaize.

NYCTOPHILUS TIMORIENSIS.

Nyctophilus timoriensis (Geoffroy), Dobson, Catal. Chiropt. p. 172 (1878).

Specimens from New South Wales collected by M. de Castelnau.

SCOTOPHILUS TEMMINCKII.

Vespertilio temminckii, Horsfield, Zool. Researches in Java (1824).

Scotophilus temminckii, Gray; Peters; Dobson, Monograph Asiat. Chiropt. p. 258 (1876).

Specimens of this very abundant and widely distributed species from Celebes, collected by M. de la Savinière.

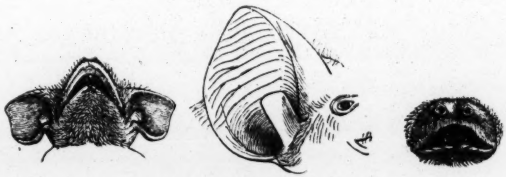
VESPERTILIO ADVERSUS, Horsfield.

Specimens of this species, which extends from Siam to South Australia, have been sent from New Guinea by M. Laglaize.

EMBALLONURA RAFFRAYANA, n. sp.

Slightly larger than *E. nigrescens* from the same region, and

agreeing with that species in the comparatively widely separated nostrils, but resembling the species of the other section of the genus in the projecting extremity of the muzzle, which extends considerably beyond the lower lip; the ears also are much broader, and the upper third of the outer margin of the conch is convex, not concave; the tragus is comparatively shorter and much broader, attaining its



Emballonura raffrayana.

greatest breadth above, where it is so broadly rounded off so as to appear abruptly truncated; the outer and inner margins are straight or faintly concave.

Wings from the ankles or from the tarsi; feet much larger than in *E. nigrescens*; calcanea about two thirds the length of the tibiæ.

Fur above dark-brown, paler at the base; beneath paler throughout. Wings nearly naked; upper surface of the interfemoral membrane thinly clothed as far as the extremity of the tail.

Teeth as in *E. nigrescens*, except that the first upper premolar is smaller, and scarcely raised above the level of the gum.

Length (of an adult ♂), head and body 1″·65; tail 0″·5; head 0″·65; ear 0″·58, tragus 0″·2; forearm 1″·55; thumb 0″·25; third finger—metacarp. 1″·3, 1st ph. 0″·4, 2nd ph. 0″·65; fourth finger—metacarp. 1″·1, 1st ph. 0·″3, 2nd ph. 0″·2; fifth finger—metacarp. 1″, 1st ph. 0″·38, 2nd ph. 0″·15; tibia 0″·6; calcaneum 0″·45; foot 0·″3.

Hab. Gilolo Island.

At the request of M. Milne-Edwards, I have much pleasure in connecting with this species the name of its discoverer, M. Raffray.

2. *Oriental Region.*

Cynonycteris amplexicaudata, Geoffr.
Cambodja (*M. Harmand*).

Cynopterus marginatus, Geoffr.
Singapore (*M. de Castelnau*).

Eonycteris spelæa, Dobson.
Java (*M. de la Savinière*).

RHINOLOPHUS ACUMINATUS, Peters.

Siam, Laos (*M. Harmand*).

This species has been previously recorded from Java only.

RHINOLOPHUS AFFINIS, Horsfield.

Cochin China (*M. Harmand*).

PHYLLORHINA DIADEMA, Geoffr.

Cochin China (*M. Harmand*); Sanghir Island (*M. Laglaize*).

The specimens from the latter locality differ from all others examined by me in the great development of the central projecting ridge of the sella, which, in one instance, projects almost as far forwards as the corresponding process of the same part of the nose-leaf in *Ph. cyclops* (see my 'Catalogue of Chiroptera,' pl. ix. fig. 1 *b*); the blunt projection in the centre of the margin of the upper transverse nose-leaf is also much more defined than in other specimens of this species, and in one of the specimens from Sanghir Island corresponds to a large cell in the back of the leaf.

PHYLLORHINA ARMIGERA, Hodgson.

Cochin China (*M. Harmand*).

One of the specimens, an adult male, has the glandular elevations between the nose-leaf and the frontal sac as much developed as in the type of this species in the Calcutta Museum, described and figured by me in the 'Proceedings' for 1873 (p. 241).

PHYLLORHINA BICOLOR, Temminck.

Cochin China (*M. Pierre*).

PHYLLORHINA FULVA, Gray.

Cochin China (*M. Harmand*).

PHYLLORHINA LARVATA, Horsfield.

Cochin China (*M. Harmand*).

These specimens have the same brilliant golden-yellow fur as those collected by Dr. Anderson at Prome, Upper Burma, and described by me in my 'Monograph of the Asiatic Chiroptera.'

CŒLOPS FRITHII, Blyth.

Laos, in the roof of the Great Pagoda at Lakhon, collected by M. Harmand.

The well-preserved specimens of this most remarkable Bat form a valuable addition to the collection of the Muséum d'Histoire Naturelle. Hitherto this species was known only from the type in the Indian Museum, Calcutta (a dilapidated skin from the Bengal Sunderbuns), and a single specimen, in alcohol, from Java, in the collection of the Leyden Museum. Examination of these specimens permits me to add a few additional notes on the structure of the species.

The calcaneum is weak, but distinct, nearly one fifth of an inch in length, and projects at its extremity slightly beyond the membrane;

there is no trace of a tail externally; the wing-membrane extends to the proximal extremity of the metatarsus; the female has pubic teat-like processes, as in other species of Rhinolophidæ; the terminal phalanx of the fourth finger ends in a large T-shaped process. The measurements agree closely with those of the specimen in the Leyden Museum.

MEGADERMA SPASMA, L.
Laos (*M. Harmand*).

SCOTOPHILUS TEMMINCKI, Horsf.
Cochin China, and Laos (*M. Harmand*).

VESPERUGO ABRAMUS, Temminck.
Cochin China and Laos (*M. Harmand*).

VESPERUGO PACHYPUS, Temminck.
Laos (*M. Harmand*).

VESPERTILIO MURICOLA, Hodgson.
Laos (*M. Harmand*); Sanghir Island (*M. Laglaize*)

TAPHOZOUS MELANOPOGON, Temminck.
Cochin China (*M. Harmand*).

NYCTINOMUS PLICATUS, Buch.-Ham.
Laos (*M. Harmand*).

3. *Ethiopian Region.*

EPOMOPHORUS COMPTUS, Allen.
Ogoné (*M. Marche*).

EPOMOPHORUS MONSTROSUS, Allen.
Ogoné (*M. Marche*).

PHYLLORHINA COMMERSONI, Geoffr.
Bugamojo, Zanzibar (*Mission du St.-Esprit*).

VESPERUGO NANUS, Peters.
Ogoné (*M. Marche*).

MYXOPODA AURITA, A. Milne-Edwards.
Madagascar (vide *antea*, p. 871).

COLEURA SEYCHELLENSIS, Peters.
Seychelle Islands (*M. Lantz*).

4. *Neotropical Region.*

MOLOSSUS RUFUS, Geoffr.
Cayenne (*M. Mélinon*).

MOLOSSUS ABRASUS, Temm.
Cayenne (*M. Mélinon*).

RHYNCHONYCTERIS NASO, Wied.

Cayenne (*M. Mélinon*).

NOCTILIO LEPORINUS.

Cayenne (*M. Mélinon*).

SCHIZOSTOMA BRACHYOTE, n. sp.

Muzzle as long, or slightly longer than the distance between the eyes; side of the face deeply grooved beneath the eye. Ear much shorter than the head, but broad at the base, owing to the strong convexity of the inner margin of the conch in its lower two thirds; at the upper third the inner margin becomes abruptly concave, and the ear terminates in a short, obtusely pointed tip: tragus simple. Nose-leaf small, the lancet very acute, but much narrower than the horse-shoe, which is slightly notched on either side, and confluent with the muzzle in front. Centre of the upper lip slightly grooved; lower lip with a shallow narrow groove between two naked prominences, each of which is divided in its upper third by a small oblique groove.

Wings from the ankles or from the extremities of the tibiæ; interfemoral membrane and tail as in other species of the genus; calcaneum slightly longer than the foot. Fur brown, above and beneath.

Dentition.—Inc. $\frac{4}{4}$; c. $\frac{1-1}{1-1}$; pm. $\frac{2-2}{3-3}$; m. $\frac{3-3}{3-3}$

Upper incisors as in *Sch. megalotis*; lower equal, grooved, not crowded; first upper premolar with a very oblique cusp, touching the canine, second straight; first lower premolar much exceeding the second in antero-posterior diameter; second premolar well developed, in the tooth-row; third premolar nearly equal to the first in vertical extent, but less than it in cross section at the base.

Length (of an adult ♂), head and body 2″·2; interfemoral membrane 0″·9; head 0″·9; ear 0″·65×0″·5, tragus 0″·28; nose-leaf 0″·3×0″·2; forearm 1″·6; thumb 0″·35; third finger—metacarp. 1″·4, 1st ph. 0″·55, 2nd ph. 0″·7, 3rd ph. 0″·35; fifth finger—metacarp. 1″·35, 1st ph. 0″·42, 2nd ph. 0″·45; tibia 0″·65; calcaneum 0″·45; foot 0″·4.

Hab. Cayenne (*M. Mélinon*).

This is a very aberrant form, differing from all the other species in the development of the chin-warts, and in the shallowness of the central groove between them, as well as in the shortness and peculiar shape of the ears. In the second phalanx of the middle finger being conspicuously longer than the first, it agrees with *Sch. behni*; but, unlike that species, it has the calcaneum longer than the foot.

CAROLLIA BREVICAUDA, Wied.

Darien (*Dr. Viguier*); Cayenne (*M. Mélinon*).

ARTIBEUS QUADRIVITTATUS, Peters.

Cayenne (*M. Mélinon*).

November 19, 1878.

Arthur Grote, Esq., V.P., in the Chair.

Mr. Sclater read the following extract from an article in 'Science-Gossip' of October 1, 1878, by Mr. R. Davenport, of Bury, Lancashire :—

"It is a pleasing duty to me to record the taking of a very beautiful specimen of what I consider an exceedingly rare bird in our neighbourhood (*Saxicola stapazina*). The specimen was shot by a friend of mine, about the middle of May this year, on the margin of the Bury and Radcliffe Reservoir; and though much mangled with number-6 shot, it has been very well mounted indeed by my friend Johnson, of Prestwich. Considering the condition it was in from being killed with such large shot, I really doubted at one time whether it could be mounted; however, it has been; and a valuable addition to our list of birds it is."

Mr. Sclater exhibited the specimen in question, which had been kindly sent up for exhibition by Mr. Davenport. It appeared to be an adult in full plumage of *Saxicola stapazina* (called by Mr. Dresser "*S. rufa*" B. of Eur. pt. xxv.). The species had not been previously recorded as occurring in the British Isles, and was an interesting addition to the list of "Accidental visitors."

The following letters from Dr. A. B. Meyer, C.M.Z.S., and Mr. Bartlett were read, in reference to the communication at the last meeting from Mr. Everett respecting the supposed existence of the Anoa (*Anoa depressicornis*) in the Philippines.

"R. Zool. Mus., Dresden,
November 16, 1878.

"DEAR DR. SCLATER,—

"Having seen in the report of the Society's meeting of the 5th November that Mr. Everett had stated, in a letter to the Marquis of Tweeddale, that the *Anoa* of Celebes (*Anoa depressicornis*) or an allied species is found in the island of Mindoro, I beg leave to send you a few notes from my diary on this subject.

"Mr. Wood of Manilla, an American gentleman, now dead, known to many travellers as a amateur naturalist, and to many European Museums as a collector, told me that Mr. Cuming (in whose company he had formerly collected) had sent home an 'Antelope' from Mindoro, similar to *Anoa depressicornis* from Celebes, which was called '*Tamarao*' by the natives. Mr. Wood had not only seen the animal in the Philippines, but also subsequently in the British Museum, where it had received a specific name of its own.

"Wishing to know something more of the 'Tamarao' in Manilla, I succeeded in finding a stuffed animal in the Museum of the Dominicans, which they told me was the animal in question. This was apparently, as far as I could make out (it was in a bad state, and

could not be closely inspected), a Buffalo, small in size, with rather straight horns bent backwards, with not much hair on the skin, which was of a light greyish colour. There was no similarity to the *Anoa* from Celebes, which I had seen the year before at Menado, as regards colour, skin, size, or horns.

"The 'Tamarao' is said to live only on Mindoro. The wild Buffalo of Luzon does not differ much from the tame one. The name for Buffalo in the Tagaloe language of Luzon is *Anooang*, the same as for *Anoa depressicornis* in South Celebes. (In the Pampanga language of Luzon, 'Damulag' means buffalo. For a wild Buffalo they say on Luzon 'Karabao cimarron,' 'cimarron' being a Spanish expression for wild.)

"When back in Europe in the same year, I looked together with the late Dr. Gray through the galleries of the British Museum for this 'Tamarao,' but in vain; we could not find it.

"In the gallery of the Jardin des Plantes of Paris, I saw this autumn a skeleton of a small Buffalo from Timor, brought home by the 'Astrolabe,' and labelled *Bubalus seligniceros*, which reminded me of the 'Tamarao' of Mindoro, as I mentioned to Prof. Gervais, who kindly accompanied me, telling him also of its supposed affinity to the *Anoa*.

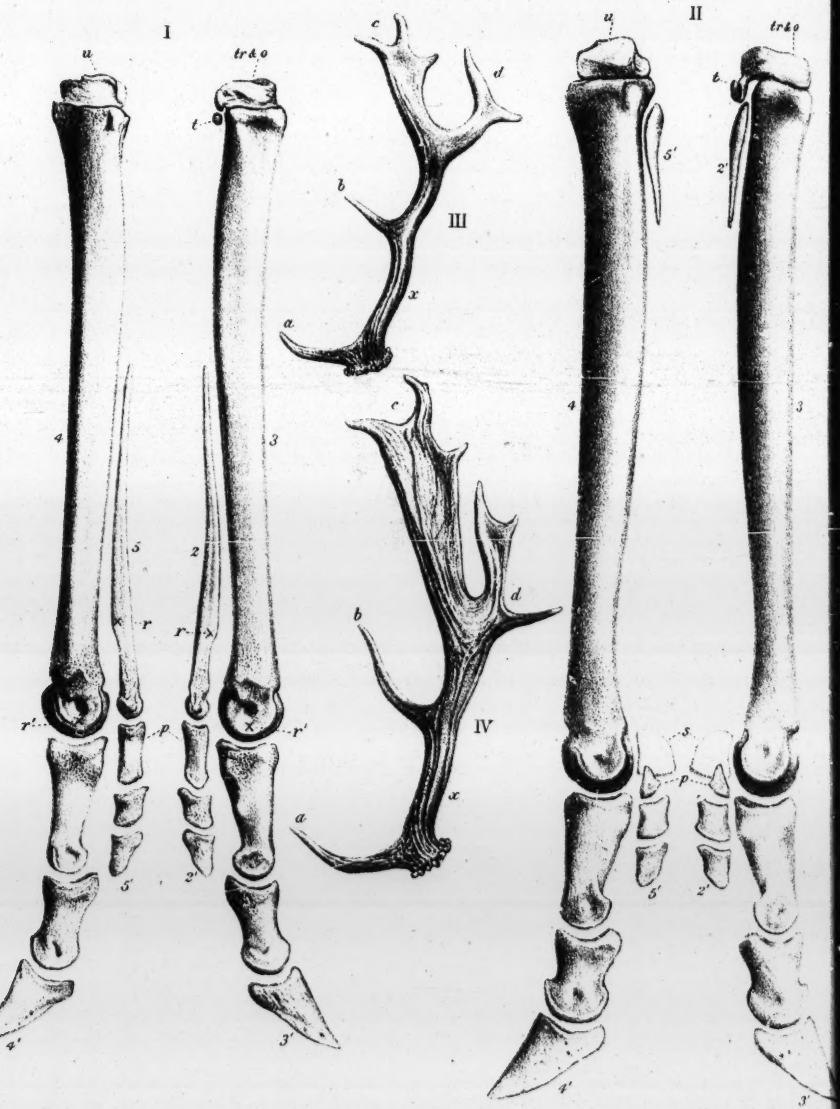
"Of course I cannot depend on the alleged identity of the stuffed Buffalo in the Museum of the Dominicans in Manilla with the 'Tamarao' of Mindoro; and, also, my inspection of this specimen was scientifically not sufficient; but I hope to be able to throw some light on this question very soon, as a skull of the real 'Tamarao' from Mindoro will be in my hands in a few days, as I bought some time ago for the Dresden Museum Professor Semper's Mammalian collection from the Philippines, which contains such a skull. I therefore shall soon recur to the subject.

"I take this occasion to remark that there exists on the island of Balabac, Philippines, a species of *Tragulus*, specimens of which I have seen living at the Government House in Cebú; but, having no books with me, I could not make out whether it differs from *Tragulus kanchil* or not.

"Yours very sincerely,
"A. B. MEYER."

"Zoological Society's Gardens,
Regent's Park, London, N.W.
November 18, 1878.

"DEAR SIR,—About thirty years since, a collector of natural-history specimens, named Napper, wrote to me from the Philippines to say that there existed on the island of Mindanao or Mindoro, a small kind of Buffalo extremely wild and difficult to obtain. I engaged him to obtain specimens; and after much trouble and expense he sent me an adult bull, a cow, and calf that he had shot and skinned. They were offered by me to Dr. Gray for the British Museum, who declined them, as he was of opinion they were only small varieties of the common Manilla or Water-Buffalo; and this was my own opinion, and that also of every one who saw them. I



J.Smit lith

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CLASSIFICATION OF THE CERVIDÆ.

kept them a long time; and not finding any one that would have them, I at last sent them to Stevens's sale-rooms where they were sold for a few shillings. I can assure you that these animals were not like the *Anoa*, but much larger, and had all the appearance of a common Indian Buffalo of small size. Yours faithfully,

"A. D. BARTLETT."

The following papers were read:—

1. On the Classification of the *Cervidæ*, with a Synopsis of the existing Species. By Sir VICTOR BROOKE, Bart., F.Z.S.

(Plate LV.)

I. Introduction, p. 883.
II. On the division of the Cervidæ into sections larger than genera, p. 885.
III. On the subdivision of the sections into minor groups, p. 889.
IV. Geographical distribution, and remarks thereon, p. 893.
V. Synopsis of the existing Cervidæ, p. 897.
VI. Explanation of Plate LV., p. 928.

I. *Introduction.*

Some years ago I brought before the notice of the Society certain pedal characters in the Cervidæ (vide P. Z. S. 1874, p. 33) which appeared to me to be of some importance; but at that time, not having had the opportunity of extending my observations to all the forms of existing Cervidæ, a generalization, which I believe to be of considerable taxonomic value, deducible from these characters, escaped my notice. A reconsideration of the characters themselves, and an attempt to work out the deductions which may be drawn from these and other established facts relating to the Cervidæ, is the object of the present paper.

Before entering into the subject immediately before us, it may be well to consider briefly the peculiarities common to all Deer, the possession of which distinguishes them from all other mammals, and which may therefore be called their family characters.

The Cervidæ, together with *Moschus*, the Giraffidæ, and the Bovidæ, constitute the Pecora, one of the four distinct sections into which the Artiodactyla, or even-toed Ungulates, is divisible. In having (1) the odontoid process crescentic, (2) the left axillary rising from the innominate artery, (3) the placenta cotyledonous, (4) the psalterium added to the stomach, and (5) the outer bones of the metapodium rudimentary, the inner confluent, all the members of the Pecora, as Professor Flower in his exhaustive paper on *Moschus* (P. Z. S. 1875, p. 159) has taught us, agree together, and differ from the three remaining sections of the Artiodactyla, viz. the Tragulina, Suina, and Tylopoda.

So far there is little difficulty in defining the zoological position of the Cervidæ. That they form part of the Pecora there can be no doubt; but when the subdivision of the Pecora is attempted difficulties arise which bid fair to set at defiance all systems of classification. An estimate of the nature and relative value of the characters which distinguish the Cervidæ from the Bovidæ will be most clearly shown by placing them in tabular form. With *Moschus* and the Giraffidæ we

need not at present occupy ourselves; in Professor Flower's paper, above referred to, the characters in which they differ from the typical Cervidæ, of which Professor Flower regards them as early offshoots, are distinctly defined.

Cervidæ.	*Bovidæ.*
(1) Osseous deciduous outgrowths from cylindrical processes of the frontals in the males of all excepting *Hydropotes*, in which genus they are wanting in both sexes. These appendages, the antlers, are absent in the females excepting *Rangifer*.	(1) Epidermal persistent (exc. *Antilocapra*) sheaths envelop processes of the frontals in both sexes, with the exception of the females of the following genera, in which these appendages, the horns, are wanting:—*Portax, Tragelaphus, Procapra, Antilope, Æpyceros, Saiga, Kobus, Cervicapra, Pelea, Nanotragus, Neotragus, Tetraceros.*
(2) Two orifices to the lacrymal duct, situated on or inside the rim of the orbit.	(2) One orifice to the lacrymal duct, situated inside the rim of the orbit. Exceptions:—*Tragelaphus sylvaticus, Tragelaphus decula, Tragelaphus angasi, Tragelaphus spekii*; in these species there are two orifices, situated as in the Cervidæ.
(3) A depression in the facial plate of the lacrymal, called the lacrymal pit or fossa.	(3) Absence of this depression. Exceptions:—*Gazella, Antilope, Nanotragus, Neotragus, Cephalophus, Tetraceros, Alcelaphus.*
(4) An anteorbital vacuity of such dimensions as to exclude the lacrymal from articulation with the nasals.	(4) Lacrymal articulates with the nasals, except in *Gazella* and *Oryx*.
(5) In all species the first molar in both jaws is brachyodont, or short-crowned, so that when the tooth is in place the neck, which is much constricted, is on a level with or a little above the alveolar border, and in the dry skull the upper ends of the roots are visible.	(5) The first molar in both jaws is hypsodont, or long-crowned, so that a large part of the crown is buried in the socket when the tooth is first in place, and there is no constriction between the long crown and the very short roots. Exception, *Tragelaphus*.
(6) Upper canines present in both sexes. Exceptions:—*Capreolus, Axis, Dama, Cariacus, Blastocerus, Pudu, Alces*, and some of the smaller Rusine Deer.	(6) Canines absent in both sexes. Exception, *Nanotragus pygmæus* has sometimes the upper milk-canine.
(7) Distal ends of the lateral metacarpals present in some.	(7) Distal ends of the lateral metacarpals wanting in all genera.
(8) The first and second	(8) The first and second pha-

Cervidæ (continued).	*Bovidæ* (continued).
phalanges of the lateral digits present. Exception, *Cervulus*.	langes of the lateral digits wanting in all.
(9) Parieto-squamosal suture nearer the upper than the lower border of the temporal fossa[1].	(9) This suture is nearer the lower than the upper border of the temporal fossa. Exception, *Antilocapra*.
(10) Navicular, cuboid, and ectocuneiform united in some.	(10) These bones never all united.
(11) Placenta with few cotyledons (*Oligocotyledontophora*, Garrod[2]).	(11) Placenta with many cotyledons (*Polycotyledontophora*, Garrod).
(12) Gall-bladder absent.	12 Gall-bladder present. Exception, *Cephalophus*.

From this table it becomes apparent that, with the exception of the eleventh, none of these characters can be considered exclusively characteristic of the Cervidæ; and even with regard to it, more extensive observation is required before it can be laid down as a fixed and exclusive Cervine character. But although, with this exception, none of the above characters can be taken *singly* as distinctive of a Cervine from a Bovine animal, the coexistence of the second, third, fourth, and fifth in all the Cervidæ and their absence in combination in the *Bovidæ* will, I think, be found universal.

Deer may therefore for the present be characterized as *Pecora* having two orifices to the lacrymal duct, situated on or inside the orbit, lacrymal fossæ, an anteorbital vacuity, cutting off the lacrymal from articulation with the nasals, the first molar brachyodont, the parieto-squamosal suture nearer the upper than the lower border of the temporal fossa, and the placenta with few cotyledons.

II. *On the Division of the* Cervidæ *into Sections larger than Genera.*

I will now pass on to the consideration of the pedal characters above alluded to.

The fore limbs of all existing species of Cervidæ exhibit one of the two following conditions.

(1) Two slender, short, detached, splint-like bones, the rudiments of the second and fifth metacarpals (Plate LV. figs. 2, 2′ and 5′), situated posterior to and one on each side of the *proximal* extremity of the metacarpal cannon (or confluent third and fourth metacarpals); the phalanges of the second and fifth digits separated from their rudimentary metacarpals by a very wide interval; the proximal phalanx of these digits (Plate LV. fig. 2 *p*) inferior in size to the central and ungual phalanges. In *Cervulus* the phalanges of the second and fifth digits are undeveloped.

[1] *Vide* Prof. Garrod, P. Z. S. 1877, p. 15.
[2] Garrod, *loc. cit.* p. 12.

(2) Two slender pointed bones, the rudiments of the second and fifth metacarpals (Plate LV. figs. 1, 2′ and 5′), situated posterior to and one on each side of the *distal* extremity of the metacarpal cannon. These bones articulate with their respective phalanges, but are separated from the carpus by a wide interval. The proximal phalanx of these digits (Plate LV. fig. 1, *p*) is superior in size to the central and ungual phalanges.

For these forms Professor Flower has kindly assisted me in finding convenient names. For the former, that in which the proximal (or near) extremities of the lateral metacarpals remain, I would propose the term *Plesiometacarpal* (πλησίον, near, and μετακάρπιον, *metacarpus*); and the latter, that in which the distal (or more remote) extremity of these bones remains, I would designate *Telemetacarpal* (τῆλε, far, μετακάρπιον, *metacarpus*).

With the view of ascertaining whether the myology of the fore limbs of the Cervidæ confirms or confutes the importance which I would assign to their osteological characters, I have been lately engaged in the examination of the muscles of the fore limbs of the Artiodactyles in general. My materials have been, however, as yet far too meagre to justify me in attaching any great weight to the characters afforded by myology; but I am encouraged in expecting that my observations may not be altogether unimportant, in which case I shall hope to lay them before the Society upon some future occasion.

I will only here mention that in the telemetacarpal limb of the Common Roe, the phalanges of each lateral digit are supplied with two tendons from the extensor muscles of the forearm—a condition precisely similar to that which obtains in the tetradactyle *Tragulus*. On the other hand, in the plesiometacarpal limb of the Red Deer and Fallow Deer, the lateral phalanges are entirely without muscular attachment. In neither the Roe, Red Deer, or Fallow Deer are the lateral phalanges supplied with tendons from the flexors. A similar condition is seen in *Tragulus*, in which form the lateral phalanges are but slightly functional; but in the telemetacarpal limb of *Moschus* the lateral phalanges are (as in *Sus*) supplied with strong tendons from the flexor profundus digitorum. In *Moschus*, the lateral phalanges are highly functional. The special office performed by the lateral phalanges is the prevention of the animal slipping when rushing at speed down slopes or sinking in swampy ground; and this function is effected without danger of the displacement of these delicate structures, by means of strong ligamentous bands developed in the aponeurosis surrounding them, which bind them firmly in their normal position. In the telemetacarpal limbs which I have examined, in addition to these bands, distinct round ligaments pass from the sides of the distal articular surface of the metapodium to the centre of the metacarpal splint on each side (Plate LV. fig. 1, *r*–*r*′), and aid in preventing its displacement upwards, upon undue pressure being applied from without.

In the annexed list of all the known species of existing Deer, arranged according to their geographical distribution, the names of

those with telemetacarpal limbs are printed in italics, and those with plesiometacarpal limbs in ordinary type. From this a remarkable parallelism becomes at once apparent between the distribution of the Cervidæ in the two main divisions of the earth's surface, and the condition of the rudimentary external digits of their fore limbs. Of the 39 species confined to the Old World, 36 are *Plesiometacarpi*, the exceptions being *Hydropotes inermis* and the two species of *Capreolus*. Of the 22 species confined to the New World, 21 are *Telemetacarpi*, *Cervus canadensis* being the sole exception. Both species of circumpolar range are *Telemetacarpi*.

Old World.	*Northern regions of both Hemispheres.*	*New World.*
1. Cervulus muntjac.	1. *Alces machlis.*	1. *Cariacus* (*Cariacus*) *virginianus.*
2. —— lacrymans.	2. *Rangifer tarandus.*	2. —— (——) *leucurus?*
3. —— reevesii.		3. —— (——) *mexicanus.*
4. Elaphodus cephalophus.		4. —— (——) *similis?*
5. —— michianus?		5. —— (——) *savannarum.*
6. Cervus (Rusa) aristotelis.		6. —— (——) *peruvianus.*
7. —— (——) equinus.		7. —— (——) *gymnotis.*
8. —— (——) swinhoii.		8. —— (——) *toltecus.*
9. —— (——) philippinus.		9. —— (——) *macrotis.*
10. —— (——) mariannus?		10. —— (——) *columbianus.*
11. —— (——) nigricans.		11. —— (*Blastocerus*) *paludosus.*
12. —— (——) alfredi.		12. —— (——) *campestris.*
13. —— (——) kuhli.		13. —— (*Furcifer*) *chilensis.*
14. —— (——) porcinus.		14. —— (——) *antisiensis.*
15. —— (——) lepidus?		15. —— (*Coassus*) *rufus.*
16. —— (——) hippelaphus.		16. —— (——) *simplicicornis.*
17. —— (Rucervus) duvauceli.		17. —— (——) *rufinus.*
18. —— (——) schomburgki.		18. —— (——) *nemorivagus.*
19. —— (——) eldi.		19. —— (——) *superciliaris.*
20. —— (Elaphurus) davidianus.		20. —— (——) *whitelyi.*
21. —— (Axis) axis.		21. *Pudua humilis.*
22. —— (Pseudaxis) sika.		22. Cervus canadensis.
23. —— (——) euopis?		
24. —— (——) maatchuricus.		
25. —— (——) dybowskii?		
26. —— (——) kopschi?		
27. —— (——) taëvanus.		
28. —— (——?) caspicus.		
29. —— (Cervus) elaphus.		
30. —— (——) xanthopygus?		
31. —— (——) eustephanus.		
32. —— (——) maral.		
33. —— cashmeerianus.		
34. —— affinis.		
35. —— (Dama) dama.		
36. —— (——) mesopotamicus.		
37. *Hydropotes inermis.*		
38. *Capreolus capræa.*		
39. —— *pygargus.*		

The fact of the plesiometacarpal and telemetacarpal limb-characters so closely corresponding with the distribution of the Cervidæ in the Old and New Worlds, would in itself have convinced me of their fundamental importance; but a certain osteological cranial cha-

racter lately discovered by Professor Garrod (see P. Z. S. 1877, p. 13, fig. 24) has confirmed me in this opinion.

Professor Garrod has observed that in all the American Deer, with the exception of *Cervus canadensis*, the vertical plate developed from the lower surface of the vomer is prolonged sufficiently downwards and backwards to become ankylosed to the horizontal plate of the palatals, and to form a complete septum dividing the nasal cavity into two distinct chambers. The posterior edge of the vertical plate of the vomer is plainly visible upon looking into the posterior nares in the dry skull. In none of the Deer confined to the Old World is the vertical plate of the vomer sufficiently developed to reach the horizontal plate of the palatals; and therefore in none is there a septum dividing the nasal cavity into two chambers separated from the anterior to the posterior nares.

This cranial character agrees with the pedal characters in placing the Reindeer, one of the species of circumpolar distribution, with the Deer of the New World. *Alces*, along with *Hydropotes* and *Capreolus*, all of which are Telemetacarpi, Prof. Garrod's cranial character places with the *Plesiometacarpi* of the Old World.

So long ago as 1836, Dr. Gray[1] pointed out characters afforded by the tufts of hair observable on the tarsus and metatarsus of most Deer, and expressed his opinion that they constitute "a means of subdividing them in natural sections." In his Catalogue of the Ruminant Mammalia in the British Museum (1872), Dr. Gray divides the Cervidæ into two primary groups:—(1) that in which tuft of hair on the outside of the metatarsus is above the middle of that bone, and (2) that in which this tuft is below the middle of the metatarsus.

Now I cannot but think it is a highly significant fact, and one that should make us very cautious in condemning any character as trivial, to find that a classification based on these apparently superficial characters coincides exactly, as far as it goes, with that founded on Prof. Garrod's cranial characters, and, with the exceptions referred to, with that based on the osseous structure of the limb.

There are some species both in the Old and the New World which are devoid of either metatarsal or tarsal tufts. When present, the metatarsal tuft is always above the middle of the metatarsus; and there is never any tuft on the inner surface of the tarsal joint in the Deer confined to the Old World. In the Deer confined to the New World, the metatarsal tuft when present is always below the middle of the metatarsus, and there is frequently a distinct tarsal tuft. *Cervus canadensis* constitutes the solitary exception.

There is yet another character which lends some weight to the teaching of those already mentioned; and for the observation of it we are again indebted to Prof. Garrod[2]. Prof. Garrod has observed that the ascending rami of the præmaxillæ articulate with the nasals in all the Old-World Deer, with one or two exceptions, whilst in the Deer of the New World, again with one or two exceptions, the rami of the præmaxillæ do not reach the nasals.

I shall not now attempt to decide the relative value of these charac-

[1] Vide P. Z. S. 1836, p. 66.

[2] P. Z. S. 1877, p. 13.

ters, a task which can only become possible when our knowledge of the extinct forms of Deer shall be very much more complete than it is at present. Accepting the facts as we find them, the existing Cervidæ may be divided into three primary sections.

A. Proximal ends of the lateral metacarpals remaining. (PLESIOMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone. Tuft of hair on the inside of the tarsus always absent.

Ascending rami of the præmaxillæ articulating generally with the nasals.

Genera:—*Cervulus*, *Elaphodus*, *Cervus* (subgen. *Rusa*, *Rucervus*, *Elaphurus*, *Axis*, *Pseudaxis*, *Dama*).

B. Distal ends of the metacarpals remaining. (TELEMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone.

Genera:—*Alces*, *Hydropotes*, *Capreolus*.

C. Distal ends of the metacarpals remaining. (TELEMETACARPI).

Posterior portion of the nasal cavity divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus when present, below the centre of that bone. Tuft on the inside of the tarsus frequently present.

Ascending rami of the præmaxillæ generally not reaching the nasals.

Genera:—*Cariacus* (subgen. *Cariacus*, *Blastocerus*, *Furcifer*, *Coassus*), *Pudua*, *Rangifer*.

Of the inequivalency and heterogeneous nature of section *B* I am most fully aware. It can only be considered a temporary receptacle for species whose natural relationship to sections *A* and *C* cannot as yet be finally decided.

III. *On the Subdivision of the Sections into minor Groups.*

The definition of the minor groups into which the three primary sections are ultimately divisible in such a manner as to render their boundaries readily appreciable, is, I believe, almost impossible. And yet that a solid bond of affinity unites the members of each natural minor group, that they possess in common certain peculiarities which distinguish them from species contained in other minor groups, no one who has studied the Cervidæ can for a moment doubt. This being so, I think that the distinct recognition of the various clusters of species, into which the Cervidæ naturally group themselves, is a matter of the first importance in an attempt to understand their entire life-history.

The question as to whether these minor groups should be regarded as genera or subgenera, or merely marked as nameless sections, appears to me to be of wholly secondary importance.

Actuated by this belief, I have retained the names originally given to these subgroups whenever the grouping has appeared to me to be natural, and have spoken of them as subgenera. The characters upon which the subgenera are based are derived principally from the form of the antlers, the skull, the rhinarium[1], external coloration, position and degree of development of the cutaneous glands, and general external form.

As is the case with the family characters, it is seldom that any one subgeneric peculiarity can be taken singly as exclusively characteristic of a certain subgenus; but the existence in different fixed combinations of these characters in the several subgenera is an empirical certainty. For example, the form of rhinarium peculiar to *Rusa* (*vide infra*) is shared by other groups, but never in combination with the form of antler and immense lacrymal pit typical of that subgenus; and no species of *Rusa* is without this combination. Again, the form of the rhinarium in the subgenus *Cervus* differs from that of *Rusa*, but resembles that of *Dama* &c.; but in *Cervus* this rhinarium is always associated with the antlers typical of that subgenus, and an anal disk of paler colour than the adjacent parts surrounding the tail; whilst in *Dama* it is combined with the palmated form of antler and tuft of long hair surrounding the prepuce. It is needless here to give further examples of this law: it will be found fully illustrated in the diagnoses of the subgenera (imperfect as these doubtless are) given in the synopsis.

The objection that antlers are absent in the females of all existing species with the exception of *Rangifer*, whilst in *Hydropotes* they are wanting in both sexes, has been frequently urged against the value of characters based on these appendages. The stability of this objection strikes me as very questionable. There can be no doubt that it would be highly convenient if such prominent and easily observed features as those afforded by the antlers were universally attainable; and the lack of their invariable occurrence is doubtless a source of some slight confusion to the systematist.

But surely the value of a character as a test of genetic affinity cannot be judged upon utilitarian principles; and if, as I think, I can show reason for believing the form of the antlers is one of the clearest proofs of the blood-relationship of the species contained in the various subgenera, characters derived therefrom must be regarded as the most trustwothy for taxonomic purposes.

In order to account for the phenomena presented by the antlers in the males of the existing Deer, four factors are necessary:—(1) The gradual evolution of the antlers from very simple to complex forms; (2) Their constant tendency to vary; (3) Variation extending far enough to induce the partial atrophy of one part of the antler

[1] I follow Illiger and Sundevall in the adoption of this term for the naked moist skin between the nostrils. It is decidedly preferable to muffle, which is French, or muzzle, which signifies something quite different in every-day speech.

to compensate for the extra development of some other part; (4) The transmission and fixation of such variations by heredity.

(1) The gradual evolution of the antlers from very simple to more complex forms.

The earliest Cervine animal of which we have any knowledge is *Dremotherium* from the early Miocene of Europe. This species was, so far as is at present known, without antlers. In the middle Miocene of France and Germany, and in a somewhat similar horizon in North America, the earliest antlered Deer as yet discovered have been found. These species, belonging to the very closely allied genera *Dicrocerus* and *Cosoryx*, possessed very short antlers with a single tine projecting forwards; in fact they closely resembled the antlers of the existing species of *Furcifer* (fig. 17, p. 923).

From this period to recent times a gradual increase in the luxuriance of growth and diversity in the form of the antlers is evidenced even by the miserably imperfect materials as yet at the command of naturalists. Of this the following forms bear witness:—

Cervus matheroni, Gerv.

Cervus matheroni, Gaudr. An. foss. Mont Léb. p. 66, pl. 13.

Horizon. Upper Miocene.

Cervus cusanus, Croiz. & Job.

Cervus cusanus, Boyd Dawk. Quart. Journ. Geol. Soc. 1878, p. 405, fig. 2.

Horizon. Pliocene (Lower?)

Cervus perrieri, Croiz. & Job.

Cervus perrieri, Boyd Dawk. Quart. Journ. Geol. Soc. 1878, p. 488, figs. 3–5.

Horizon. Pliocene.

Cervus cylindricornis, Boyd Dawk. Vide *loc. cit.* p. 415, figs. 11, 12.

Horizon. Upper Pliocene.

Cervus tetracerus, Boyd Dawk. *loc. cit.* p. 417, figs. 13–17.

Horizon. Upper Pliocene.

Megaceros hibernicus.

Horizon. Post-tertiary Deposits.

Cervus elaphus.

Horizon. Post-tertiary deposits, and existing epoch.

I need hardly say that these species have no direct affinity to each other; they are simply chosen as illustrating the general fact that the antlers of the Cervidæ have gradually increased in complexity from the Upper Miocene period to recent times.

It might at first sight appear as though the occurrence of existing species with very simple antlers militated against the more compre-

hensive fact of the gradual augmentation of complexity in these organs through geological time; but as the converse, namely the existence of highly complicated antlers in the Miocene and Pliocene periods, finds no support in the Geological record, the simple antlers of some existing species may be, I think, safely regarded as the result of arrestation, dependent on a less severe struggle for existence, or possibly upon some hitherto undiscovered influence.

(2) A constant tendency to vary.

Of this, any one can satisfy himself by the inspection of large collections of antlers. No two antlers are ever exactly alike; and the variations to which the antlers are subject in some species (*e. g. Cervus elaphus*, vide infr. p. 910) is so great, that in the absence of a large series they would be held as indicative of several distinct species.

(3) Variation extending far enough to induce the partial atrophy of one part of the antler to compensate for the extra development of some other part.

To illustrate this subject exhaustively would occupy more space than can be well devoted to it in the present paper. An attentive examination of any large collection will yield abundant evidence that such is invariably the case. It will, perhaps, be sufficient for my present purpose to bring forward one special example. The normal form of the upper half of the antlers of the common Fallow Deer (fig. 9, p. 914) may be described as broadly palmated, with several rudimentary tines produced from the posterior margin of the palm, the tine situated lowest on the palm exceeding the others slightly in length (fig. 9, *d*). In my cousin Mr. J. Bloomfield's place, Castle Caldwell, on the shores of Lough Erne, there is a herd of Fallow Deer which have lived at large in the woods, and under perfectly natural conditions, for upwards of 50 years. The antlers of these Deer are so remarkable in form, and present the peculiarities in which they are remarkable so constantly, that they could be recognized amongst a large collection of Fallow-Deers' antlers without the slightest difficulty. The tine growing from the inferior and posterior border of the palm (Plate LV. fig. 3, *d*) is in the Castle-Caldwell Deer immensely developed, and the palm itself is much contracted and seldom bears more than 3 or 4 tines. Variation is still actively at work on the antlers of these Deer, and reversion towards the normal form occasionally asserts itself; but, notwithstanding, a fixed type of antler has stamped itself indelibly upon the males in this herd in the short space of 50 years, and the peculiarities characteristic of that type are unquestionably the result of the extra development of one of the posterior tines and the consequent partial atrophy of the palm.

(4) The transmission and fixation of such variations by heredity.

That this is the case has been in a large measure proved by what has been already said; but the following fact places the matter beyond all possibility of doubt. The Castle-Caldwell Deer are the descendants of about one or two males and twice as many females. A single antler of one of the fathers of the herd has been fortunately preserved in the Museum at Castle Caldwell. This antler (Plate

LV. fig. 4) I have the pleasure of exhibiting this evening. It will be seen that it presents the same peculiarities that are characteristic of the distant descendants of its original owner, and that we have here a direct proof of heredity transmitting, and to a very great extent fixing, a definite and prominent variation[1].

Did space permit I could give many more illustrations corroborating the evidence of the above-mentioned facts. Innumerable instances of the power of heredity to transmit and fix variations in the antlers until some stronger influence interferes, are enacted annually before my eyes, amongst about 600 Deer of several different species preserved in my parks. Enough has, however, I think, been adduced to leave the *onus probandi* upon those who deny to characters derived from the antlers the right to be considered one of the surest land-marks of affinity in the Cervidæ.

IV. *Geographical Distribution of the* Cervidæ, *and Remarks thereon.*

Genera and Subgenera.	Number of species.	W. Palæarctic Reg. W. of long. 70° E.	E. Palæarctic Reg. E. of long. 70° E.	Indian Region.	Nearctic Region.	Neotropical Region.
		No. of sp.	No. of sp.	No. of sp.	No. of sp.	No. of sp.
Cervulus ...	3	...	...	3		
Elaphodus...	2	...	...	2		
Rusa	11	...	...	11		
Rucervus ...	3	...	...	3		
Elaphurus...	1	...	1			
Axis	1	...	...	1		
Pseudaxis ...	7?	1?	4	2		
Cervus	7	2	4	...	1	
Dama	2	2				
Hydropotes .	1	...	1			
Capreolus ...	2	1	1			
Cariacus.....	10?	...	...	...	7	3
Blastocerus..	2	...	...	...	...	2
Furcifer.....	2	...	...	...	...	2
Coassus	6	...	...	...	...	6
Pudu	1	...	...	...	...	1
Total	61	6	11	22	8	14

[1] The production of so marked a variation from the form of antler typical of *Dama vulgaris* in the short space of fifty years as that exhibited by the Castle-Caldwell Fallow Deer might be considered as tending to prove the instability of the original specific characters. It may, however, be observed that the general form of antler typical of the species has not been obliterated by the evolution of the characters now peculiar to the variety, but that, on the contrary, heredity has preserved a record of the earlier, or specific, alongside of the later, or varietal, modification. Essentially analogous phenomena are presented by the antlers typical of the species and subgenera of the Cervidæ, the distinctive specific characters being, in every instance, an evident modification of the form of antler characteristic of the subgenus.

In this Table, showing the geographical distribution of the Cervidæ exclusive of the Elk and Reindeer, which have a circumpolar range, the following are the most important facts observable. Out of a total of 61 species 39 are confined to the Old and 22 to the New World. Of the 39 Old-world species 33 are found in the Eastern Palæarctic and Indian regions, the latter containing 22 species, a much larger number than that contained in any one of the remaining four regions.

Of the 22 species confined to the New World, 8 are found to the north and 14 to the south of the Isthmus of Tehuantepec, the division adopted by Mr. Sclater between the Nearctic and Neotropical regions. These figures cannot, however, be taken as affording a just estimate of the relative degree of specialization of the Cervidæ in the Nearctic and Neotropical regions respectively. On the one hand, the three species of *Cariacus* in the latter are undoubtedly immigrants from the former region; and on the other hand, the species contained in the subgenera *Coassus* and *Furcifer* are, as far as the antlers are concerned, amongst the least-specialized of existing species.

Out of the eleven genera into which the Old-world Deer are divisible, there is only one (*Dama*) which has not a representative in either the Palæarctic or Indian region.

Owing to the exceeding paucity of Palæontological material, any attempt to account for the present differentiation and distribution of the Cervidæ must be considered as purely tentative; and I venture to put forward the following hypothesis, more to provoke investigation and criticism, which may possibly bring new and more correct ideas to light, than from any great confidence that I feel in its approximation to completeness.

In order to avoid unnecessary recapitulation, and to indicate as clearly as possible the interdependence of the facts and hypothesis, I shall place the facts and theory in two columns, numbering the former, and merely introducing the number attached to each fact before the deduction or deductions which are drawn from it.

Facts.	*Hypothesis.*
(1) So many characters are common to the Cervidæ and Bovidæ that it is very difficult to lay down definitions distinctive of the families.	(1) A very high degree of specialization had been attained by the common ancestor of the Cervidæ and Bovidæ, especially in the structure of the skull, dentition, and limbs; hence the possibility of divergence of character in its descendants was much restricted.
(2) *Dremotherium*, the earliest known Cervine form, was without antlers and tetradactyle.	(2) For a long period the early ancestors of the Cervidæ, which were tetradactyle,

Facts (continued).

(3) The antlers of the European *Procervulus* and of some species of the North-American *Cosoryx* appear to have been persistent.

(4) The antlers of *Dicroceros* and *Cosoryx* possessed one, or at most two tines.

(5) The increase in the complexity of the antlers of extinct species accompanies their chronological sequence in geological time.

(6) In a conversation which I have lately had with Prof. Marsh, he informed me that some of the specimens of *Cosoryx* collected by him in North America were tetradactyle. The lateral metacarpals in these specimens are excessively attenuated in the centre third of their length. In other specimens Prof. Marsh tells me a natural separation had taken place between the proximal and distal ends of the bones.

(7) The condition of the lateral metacarpals separates existing Deer into two great groups, the *Plesiometacarpi* and *Telemetacarpi*.

Hypothesis (continued).

remained unantlered; and spread from the centre of their geographical area (13), which was probably in the Eastern Palæarctic and Indian regions, they passed westward into Europe, and eastward into North America. (3) Processes then became developed from the frontals, which gradually elongated and in some instances branched. At first these outgrowths from the frontals remained persistently attached; but eventually the great advantage enjoyed by individuals who through necrosis lost, and through an inherited tendency to produce frontal processes renewed their antlers, over individuals who retained antlers broken and rendered useless by frequent combats, caused the natural selection of the former in the struggle for existence. (4, 5) These first deciduous antlers were exceedingly simple; but as time rolled on the advantage of large and complex antlers as a means of offence and defence established an ever-increasing tendency towards complexity in their form. (6) A diminution in the size of the lateral digits of the early forms of Deer accompanied the increase in the size of their antlers. The centre part of these bones, after attaining an extreme degree of atrophy, at last ceased to ossify. (7, 8) In some species the default in ossification took place nearer the distal than the proximal extremity of the bone. In others the converse obtained. The reduction of the rudiments steadily continued, resulting eventually in the disappearance of the shorter rudiment in both forms. Hence the origin of the plesiome-

Facts (continued).

(8) In some of the *Telemetacarpi* the distal extremities of the lateral metacarpals is two thirds the length of the metacarpal cannon. In some of the Bovidæ (e. g. *Gazella*), of which family all the species are plesiometacarpal, the proximal extremity of these bones is two thirds the length of the metacarpal cannon.

(9) With three exceptions all the Old-world Deer are plesiometacarpal; and with one exception all the New-world Deer are telemetacarpal.

(10) In none of the Old-world Deer is the vomer sufficiently prolonged backwards to divide the nasal cavity into two chambers. In all the New-world Deer the nasal cavity is so divided.

(11) The vomer of *Megaceros hibernicus* exhibits an intermediate condition. The limb in this form is plesiometacarpal, and as highly specialized as in the existing *Plesiometacarpi*.

(12) The *Telemetacarpi* of the Old World resemble the *Plesiometacarpi* in the form of their vomer and in the position of the metatarsal tufts.

(13) Thirty-three out of the thirty-nine species of Old-world Deer are inhabitants of the Indian or East Palæarctic regions; and of the eleven subgenera into which they are divisible there is only one (*Dama*) that has no representative in these regions.

Hypothesis (continued).

tacarpal and telemetacarpal condition of limbs in existing Cervidæ. (9) It is probable that the separation between the upper and lower extremities of the metacarpals took place long after the first *Dremotherium*-like Cervidæ had found their way into North America. In these the default in ossification began in the upper third of the lateral metacarpals; (12) whilst in the Cervidæ remaining in the Old World both modes of reduction obtained a footing, the Plesiometacarpi gaining ultimately the preeminence. (10) The vomer in the early forms of Deer was, as in the existing less-specialized Artiodactyles (e. g. *Hippopotamus*, *Sus*, *Tragulus*), prolonged backwards, dividing the nasal cavity into two distinct chambers. (11) As the competition between rapidly multiplying and allied forms became severe in the Old World, specialization extended to this part of the cranium, and a reduction in the backward extension of the vertical plate of the vomer, and consequent modification of the surrounding parts, set in. It is not improbable that the limbs of the *Plesiometacarpi* had nearly reached their present stage of specialization before the form of their vomer departed from the primitive type. The Deer of the New World, being less numerous both in individuals and species, and not being subjected to such severe competitions as the Old-world Deer, retained the primitive form of vomer. The greater development of the antlers in the larger majority of Old-world Deer, as compared with those of the New-world Deer, may be

Facts (continued).	*Hypothesis* (continued).
(14) There are only twenty-two species in America; and the South-American species have remarkably simple antlers.	attributed to the same cause. (14) The Deer of South America, which, according to the theory under consideration, have been freer from contact with allied forms than species inhabiting districts nearer to, and more in direct continuity with, the centre of the family area of distribution, are remarkable for the great simplicity of their antlers.
(15) The antlers of the Cervidæ are subject to great variation; and such variations are transmissible by heredity. (16) Two species have a circumpolar range, and *Cervus canadensis*, a species allied to the common Red Deer of Europe, is found in North America.	(15, 16) For long periods there was no possibility of communication between the Deer of the Old and New World; and during this time the perpetuations by heredity of the more favourable varieties which arose from time to time resulted in the divergence of the Cervidæ into the clusters of species which we now term genera. (16) At length the means of dispersal was for a second time opened between Asia and North America; an interchange of species took place; the ancestors of *Cervus canadensis* passed over into North America from the Old World, and the Elk and Reindeer extended their range till it was circumpolar.

In the following synopsis I have admitted every species of whose invalidity I am not absolutely certain; and frequently, even where I have felt grave doubts as to the soundness of the claims of a species to specific recognition, I have left it distinct, if by so doing I have thought it probable that future investigation of its claims may throw light on the important problems of geographical variation and distribution. Where colour is not mentioned in the diagnoses it affords no generic or subgeneric character. Supplementary columns are absent in the molars, and the central incisors are much expanded, where the contrary is not stated. Where the metatarsal and tarsal tufts are not specially mentioned, they are present.

V. *Synopsis of the existing* Cervidæ.

A. Proximal ends of lateral metacarpals remaining.

(Plesiometacarpi.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone. Tuft of hair on the inside of the tarsus always absent.

Ascending rami of the præmaxillæ articulating with the nasals. (Exception, species 3, in genus 1.)

1. Cervulus.

1816. *Cervulus*, Blainv. Bull. Soc. Phil. p. 74.

1827. *Stylocerus* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 319.

1836. *Prox*, Ogilby, P. Z. S. 1836, p. 135.

Antlers half the length of the head, and placed on pedestals which nearly equal (and sometimes surpass) them in length. Brow-antler (fig. 1, *a*[1]) very short, inclined inwards and directly upwards. Terminal extremity of the beam (fig. 1, *x*), which is unbranched, curved downwards and inwards. Lacrymal pit of great depth and extent, the facial plate of the malar taking part in its floor. Anteorbital vacuity of moderate extent. Ascending rami of the præmaxillæ equalling or exceeding the nasals in length. A strong ridge passes from the root of each pedestal over the orbit, lacrymal pit, and anteorbital vacuity, serving to protect frontal cutaneous glands which lie on its inner surface. Auditory bullæ very

Fig. 1



Cervulus muntjac.

slightly inflated, the tympanohyal abutting against the paroccipital process.

Canines strongly developed in the males, and curved downwards, backwards, and outwards; in the females they are small; and in neither are the pulps persistent.

Rhinarium extensive, completely surrounding the nostrils, the upper border of its internarial portion slightly convex. Prænarial portion of the rhinarium broad, its lateral borders passing subvertically downwards to the upper lip. No metatarsal tufts. Tarsus with the navicular, cuboid, and ectocuneiform united. Phalanges of lateral digits absent in both fore and hind extremities. Young spotted (exc. species 1?). Stature small.

Distribution. Indian and South-eastern Palæarctic regions.

[1] Prof. Garrod, in his valuable paper to which I have so frequently alluded (P. Z. S. 1877, p. 16), has drawn attention to a law of which the various modifications of the antlers in the Cervidæ are, in his opinion, the result. I have ventured to extend, and in some slight degree to modify, Prof. Garrod's suggestion. The lettering in the woodcuts indicates the parts of the antlers which appear to me to be homologous.

1. Cervulus muntjac.

1780. *Cervus muntjac*, Zimm. Geogr. Gesch. Band ii. p. 131.
1785. —— *muntjak* et *vaginalis*, Bodd. Elench. Anim. vol. i. p. 136.
1867. *Cervulus aureus*, Jerd. Mamm. p. 264.
1873. —— *amostylis* et *tamulicus*, Gray, Hand-list Rum. Mamm. p. 165.
1874. —— *muntjac*, Brooke, P. Z. S. 1874, p. 38, fig. 3.

Range. British India, Burmah, Malay peninsula, Sumatra, Java, Hainan, Banka, Borneo.

This species appears to attain a larger size in Java, Sumatra, and Borneo than it does on the mainland; and I think it not improbable that persistent race-characters may eventually be found, distinguishing the Muntjac of these islands from that of British India.

2. Cervulus lacrymans.

1871. *Cervulus lacrymans*, Alph. M.-Edw. Nouv. Arch. du Mus. t. vii., Bull. p. 93; and Rech. s. l. Mamm. p. 348, pls. 63, 64.
1872. —— *sclateri*, Swinh. P. Z. S. 1872, p. 814.
1874. —— ——, Brooke, P. Z. S. 1874, p. 40, pl. 8 & fig. 4.

Hab. Moupin (*David*); hills near Hangchow, China (*Swinhoe*). Type, Mus. d'Hist. Nat. Paris.

3. Cervulus reevesii.

1838. *Cervus reevesii*, Ogilby, P. Z. S. 1838, p. 105.
1862. *Cervulus reevesi*, Swinh. P. Z. S. 1862, p. 361.
1874. —— ——, Brooke, P. Z. S. 1874, p. 41, fig. 5.

Range. Southern China from latitude of Canton as far north as Ningpo; Formosa (*Swinhoe*).

2. Elaphodus.

1871. *Elaphodus*, Alph. M.-Edw. Nouv. Arch. du Mus. p. 93, pl. 7; and Rech. Mamm. p. 353, pls. 65–67.
1874. *Lophotragus*, Swinh. P. Z. S. 1874, p. 452.

Antlers very small, unbranched, supported on slender, long, converging pedestals. Ascending rami of the præmaxillæ very strong, and articulating broadly with the nasals, to which they are inferior in length. No supraorbital ridges or frontal cutaneous glands. Canines in the male massive and long, curved downwards, and not everted. A well-developed frontal tuft. In other respects resembles *Cervulus*, with which genus *Elaphodus* may be united to form the subfamily *Cervulinæ*, as proposed by Professor Garrod (P. Z. S. 1876, p. 765).

Distribution. South-Eastern Palæarctic region.

1. Elaphodus cephalophus.

1871. *Elaphodus cephalophus*, Alph. M.-Edw. (*loc. cit. suprà*).

Hab. Moupin (*David*). Type, Mus. d'Hist. Nat. Paris.

2. ELAPHODUS MICHIANUS.

1874. *Lophotragus michianus*, Swinh. P. Z. S. 1874, p. 452, pl. 59.
1876. —— ——, Garr. P. Z. S. 1876, p. 757, pl. 76.

Hab. Neighbourhood of Ningpo (*Swinhoe*). Type, Mus. Berlin.

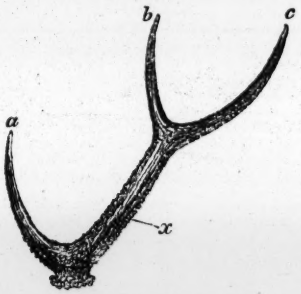
Although I feel sure that Professor Garrod is correct in uniting the genera *Elaphodus* and *Lophotragus*, I have been unable to satisfy myself that the types of the two genera are referable to the same species, as he supposes. I have therefore refrained from amalgamating the Moupin and Ningpo specimens in a single species, and have left the question for the present open.

3. CERVUS.

(RUSA, subgen.)

1827. *Rusa* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 309.

Fig. 2.



Cervus (*Rusa*) *aristotelis.*

Antlers twice or thrice the length of the head, supported on pedestals of moderate length. Brow-antler (fig. 2, *a*) strong, curved boldly upwards, its axis forming an acute angle with that of the beam. The beam (fig. 2, *x*) bifurcates, giving rise to two strong tines (fig. 2, *b* & *c*). Lacrymal pit of very great depth and extent, its antero-posterior diameter exceeding that of the three upper molars. Anteorbital vacuity very large. Auditory bullæ but slightly inflated and rugose externally (exc. species 8 and 9). Rudimentary canines present in both sexes (exc. species 6, 7, 8, 9). Molars with small supplementary columns.

Rhinarium resembling that of *Cervulus*, but less extensive, its upper internarial margin being slightly concave, and its infranarial portion narrower. Tail of moderate length. Neck maned (exc. species 7 and 9). Colour uniform brown (exc. 7 and 9). Stature diverse, the largest species being amongst the largest, and the smaller almost amongst the smallest of the Cervidæ. Young unspotted (exc. species 7 and 9).

Distribution. Indian region.

(*α*) *The upper tines* (*b* & *c*, fig. 2) *of nearly equal length in adult animals; in young males the outer and anterior tine* (*b*, fig. 2) *the longer.*

1. CERVUS ARISTOTELIS.

1835–7. *Cervus aristotelis*, Cuv. Oss. foss. (ed. 4) tom. vi. p. 84.

Range. British India, Ceylon, Burmah, Siam, Hainan (*Swinh.*).

(*β*) *The outer tine* (*b*, fig. 2) *always surpassing the inner tine* (*c*) *in length.*

2. CERVUS EQUINUS.

1825. *Cervus equinus*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 454; ib. (ed. 4) pl. 201. fig. 10.

1839–44. *Cervus equinus*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool. p. 213, pls. 42–45. figs. 7–11.

Range. Borneo, Sumatra (*Müll.*); Singapore (*Brooke*).

I have seen several living specimens of this species, all of which in their much darker colour, more bushy tail, short slightly curved antlers, presented a *tout ensemble* very unlike the common Sambur. On the other hand, I have received skulls and antlers from Siam which are strikingly intermediate between typical specimens of *Cervus aristotelis* and *C. equinus*. It appears to me therefore probable that the existence of these intermediate forms may ultimately render it impossible to maintain the distinction of the species.

3. CERVUS SWINHOII.

1862. *Rusa swinhoii*, Sclat. P. Z. S. 1862, p. 152, pl. 17.

1862. —— ——, Swinh. loc. cit. p. 364.

1871. —— ——, Sclat. Trans. Z. S. 1871, p. 333, pl. 39.

Hab. Formosa. Type, Brit. Mus.

This species closely resembles *Rusa equinus*.

4. CERVUS PHILIPPINUS.

1827. *Cervus philippinus*, Ham. Sm., Griff. An. Kingd. vol. iv. p. 147, and vol. v. p. 319.

1877. —— ——, Brooke, P. Z. S. 1877, p. 51, pl. 8.

Hab. Luzon (Philippines). Type, Mus. d'Hist. Nat. Paris (No. 409 in Cat.).

5. CERVUS MARIANNUS.

1820. *Cervus mariannus*, Desm. Mamm. sp. 669, p. 436.

1877. —— ——, Brooke, P. Z. S. 1877, p. 53.

Hab. Island of Guam (Marianne Islands). Type, Mus. d'Hist. Nat. Paris (414 *a* in Cat.).

As I have stated in my paper above referred to, I feel pretty certain that this and the preceding species are identical. I am, how-

ever, now, as then, unable to substantiate this opinion satisfactorily, owing to insufficiency of material.

6. CERVUS NIGRICANS.

1877. *Cervus nigricans*, Brooke, P. Z. S. 1877, p. 57, pls. 9, 10.
Hab. Philippines (exact locality?). Type, in my own collection.

7. CERVUS ALFREDI.

1870. *Cervus alfredi*, Sclat. P. Z. S. 1870, p. 381, pl. 28.
1877. —— ——, Brooke, P. Z. S. 1877, p. 59.
Hab. Philippines (Luzon?). Type, Brit. Mus.

8. CERVUS KUHLI.

1839–44. *Cervus kuhlii*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool. p. 223, pls. 44, 45. figs. 12–14.
Hab. Bavian Islands. Type, Mus. Leyden.
This species was originally described by Müller from specimens collected by Diard in the Bavian Islands, to which locality the species, as far as is at present known, is confined. The auditory bullæ in *Cervus kuhli* are largely inflated. By this character the skull may be distinguished from that of any of the Rusine deer with the exception of *C. porcinus*. The skull of *C. kuhli* differs from that of *C. porcinus* in having the facial portion anterior to the orbits much more compressed, and the orbits much more prominent. *C. kuhli* has proportionally much longer limbs than *C. porcinus*; and all the hairs of the back and sides are annulated in the former and not in the latter species. The young of *C. kuhli* are unspotted, which is not the case with those of *C. porcinus*[1]. Both species are devoid of upper canines.

9. CERVUS PORCINUS.

1777. *Cervus porcinus*, Zimm. Spec. Zool. Geogr. Quadr. p. 552, sp. 6.
Range. British India, Ceylon, Burmah.

10. CERVUS LEPIDUS.

1844. *Cervus lepidus*, Sund., Pec., Vetensk. Akad. Handl. p. 180, sp. 14.
Hab. Java? Type, Mus. Frankfort?
This is a very doubtful species. Some years ago I saw the type in the museum at Frankfort; and it appeared to me to closely resemble *Cervus sika*. Upon the occasion of my last visit to Frankfort I sought in vain for the specimen, and much fear that it has been destroyed.

[1] *Vide* Sclater, P. Z. S. 1863, p. 224.

(γ) *The inner tine* (fig. 3, *c*) *always surpassing the outer tine* (fig. 3, *b*) *in length.*

11. CERVUS HIPPELAPHUS.

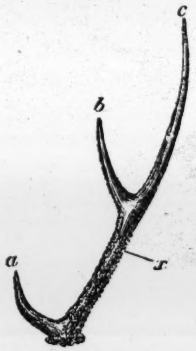
1825. *Cervus hippelaphus*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 40; ib. (ed. 4) tom. vi. p. 77, pl. 166. figs. 31–34.

1839–44. *Cervus rusa*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool. p. 217, pl. 43, pl. 44. figs. 1–6.

Hab. Java, Borneo (introduced).

Deer resembling *Cervus hippelaphus* in every particular excepting size are found in many of the islands in the Indo-Malayan and Austro-Malayan regions. How far these are the result of natural distribution, or how far their occurrence is attributable to artificial transportation is now most difficult to decide. The best authorities on the fauna of the East Indies, Wallace, Schlegel, and Müller,

Fig. 3.



Cervus (*Rusa*) *hippelaphus.*

are inclined to lean towards the latter alternative; and it is I think certain that the introduction of many of the larger mammals (*e. g.* Monkeys, Pigs, and Deer) into the islands of the Austro-Malayan region has been effected by the Malays, who, according to Wallace, are much given to taming animals and conveying them from island to island. At the same time, the existence of a species of *Felis* peculiar to Timor, and of the singular *Anoa depressicornis* on Celebes, seems to me to necessitate caution in accepting this solution as of universal application.

I shall therefore, for the present, keep the references to *Cervus timoriensis* of Timor and *C. moluccensis* distinct.

12. (*a*) CERVUS TIMORIENSIS.

1822. *Cervus timoriensis*, Blainv. Journ. de Phys. vol. xciv. p. 267.

1825. —— *peronii*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 46.

1833. *Cerf de Timor*, F. Cuv. Mamm. pl. 361.
1852. *Cervus peronii*, Puch. Cerf, Arch. du Mus. vol. vi. p. 409.
1839–44. *Cervus rusa*, var. *timoriensis*, Schl. et Müll. Verh. Ned. Bez. Zool. pp. 212, 220.

Hab. Timor (*Peron, Dussumier*), Samao, and Cambing near Timor (*Schlegel and Müller*).

Specimens examined:—

Type of F. Cuvier's and Pucheran's descriptions, Mus. d'Hist. Nat. Paris.
Müller's types, Mus. Leyden.
Specimen from Leyden, British Museum.
Living specimens in Zool. Gardens of Paris and Rotterdam.

The Timor Deer is a short-legged, thickset animal. The facial profile is remarkably concave, a character which I have frequently noticed in Red Deer and Fallow Deer living under unfavourable circumstances. *C. timoriensis* is not more than half the size of *C. hippelaphus*.

(β) CERVUS MOLUCCENSIS.

1830. *Cervus moluccensis*, Quoy et Gaim. Zool. de l'Astrolabe, tom. i. p. 133, pl. 24.
1839–44. *Cervus rusa*, var. *moluccensis*, Schl. et Müll. Verh. Ned. Bez. Zool. pp. 212, 220.
1836. *Cervus moluccensis*, Eyd. et Gerv. Mag. de Zool. tom. vi. p. 26.
1839. —— ——, Eyd. et Gerv. Zool. de la Favorite, tom. v. Mamm. p. 26.

Hab. Bouru (*Quoy and Gaimard*), Amboina (*Schlegel and Müller*), Celebes (*Beccari*).

Specimens examined:—

Schlegel and Müller's types, Mus. Leyden.
Specimens collected by Beccari, Museo Civico, Genoa.

Cervus moluccensis is a much more delicately built, graceful animal than *C. timoriensis*.

The following are the dimensions of one of Beccari's specimens (♂):—

	Eng. inches.	Metre.
Total length of skull in a straight line	11	0·280
From ant. rim of orbit to free extremity of præmaxillæ	5·7	0·145
Length of upper molar series	1·8	0·045
Length of upper premolar series	1·4	0·035
Greatest length of nasals	3·5	0·088
Length of præmaxillæ	2·9	0·073
Across the lower rims of orbits at the widest place	4·5	0·114
Length of humerus	7·9	0·200
Length of radius	7·2	0·183

	Eng. inches.	Metre.
Length of metacarpal cannon	6·1	0·155
Length of femur	9·7	0·245
Length of tibia	10·5	0·265
Length of metatarsal cannon	7	0·178

(RUCERVUS, subgen.)

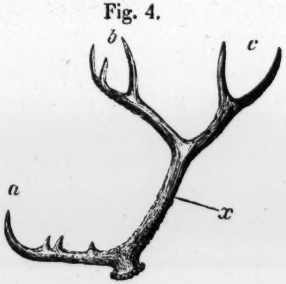
1838. *Rucervus* (subgen.), Hodgs. Ann. Nat. Hist. vol. i. p. 154; J. As. Soc. Beng. vol. x. pt. ii. p. 914 (1841).

Antlers on short stout pedestals. Brow-antlers (fig. 4, *a*) very powerful, projecting forwards at a right angle from the beam, sometimes forked, and frequently developing rudimentary tines from their upper surface. Beam curving boldly forwards along the upper half of its length, and bifurcating into two upper tines, which in their relative dimensions present specific differential characters.

Skull narrower in proportion to its length, in other respects resembling that of *Rusa*: the bullæ are moderately inflated, and the upper and under molars have small supplementary columns. Tail short. Neck maned. Stature large. Young spotted.

Distribution. Indian region.

Fig. 4.



Cervus (*Rucervus*) *duvauceli.*

13. CERVUS DUVAUCELI.

1835–37. *Cervus duvaucelli*, Cuv. Oss. foss. (ed. 4) tom. vi. p. 89, pl. 201. figs. 6–8.

1871. —— ——, Sclat. Trans. Zool. Soc. vol. vii. p. 346, pl. 36.

Hab. Nepal; Assam; Denwa valley, Mahadeo hills, Central India (*Forsyth*).

14. CERVUS SCHOMBURGKI.

1863. *Rucervus schomburgki*, Blyth, P. Z. S. 1863, p. 155, fig.

1867. —— ——, Blyth, P. Z. S. 1867, p. 835, figs. 6–12.

1876. *Cervus schomburgki*, Brooke, P. Z. S. 1876, p. 304, figs. 1, 2: Scl. P. Z. S. 1877, p. 682.

Hab. Siam. Types, Brit. Mus.

15. CERVUS ELDI.

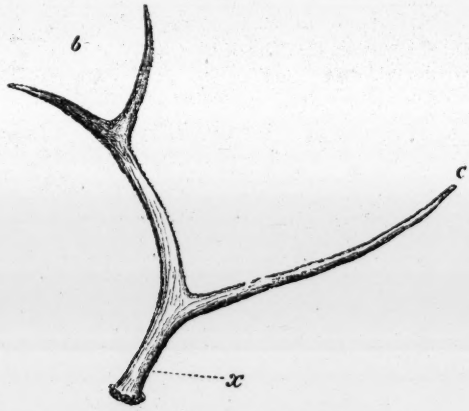
1842. *Cervus eldi*, auct. anon. Calc. Journ. vol. ii. p. 417.
1867. —— ——, Beavan, P. Z. S. 1867, p. 759.
1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 348, pls. 37, 38.
Hab. Burmah; Siam; Hainan (*Swinh.*).

(ELAPHURUS, subgen.)

1866. *Elaphurus*, Alph. M.-Edw. Compt. Rend., and Ann. Sc. Nat. ser. 5, tom. v. p. 380, and Nouv. Arch. du Mus. 1866, vol. ii. p. 27.

Antlers dichotomous, about twice the length of the head, pedestals short. The anterior branch of the antlers (fig. 5, *b*) more strongly developed than the posterior branch (fig. 5, *c*.), and in adult specimens bifurcating and carrying many strong tines. Facial portion of the skull much elongated. Ascending rami of the præmaxillæ of great length, articulating broadly with the nasals. Nasals long, and ex-

Fig. 5.



Cervus (*Elaphurus*) *davidianus.*

panded posteriorly between the large anteorbital vacuities, of which they form the larger part of the superior border. Lacrymal pit deep and large. Upper molars with supplementary columns. Ears small and narrow. Eye small. Tail long. Neck maned. Stature large. Young unspotted?

Distribution. North-eastern Palæarctic region?

16. CERVUS DAVIDIANUS.

1866. *Elaphurus davidianus*, Alph. M.-Edw. Nouv. Arch. du Mus. 1866, vol. ii. p. 27, pls. 4, 5, 6.
1871. —— ——, Sclat. Trans. Z. S. vol. vii., p. 333, pl. 28.
Hab. Mantchuria. The specimens which have reached Europe

were brought from the imperial park, south of Pekin. Types, Mus. d'Hist. Nat. Paris.

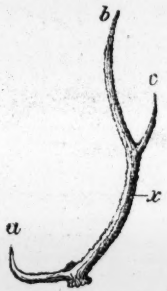
(Axis, subgen.)

1827. *Axis* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 312.

Antlers about three times the length of the head, supported on slightly elongated pedestals. Brow-antler (fig. 6, *a*) rising at something less than a right angle from the beam (fig. 6, *x*), which bifurcates at a little above the half of its entire length. Of the tines thus formed, the external and anterior tine (fig. 6, *b*) is much the longer. Skull and rhinarium as in *Rusa*. Upper canines wanting. Molars with small supplementary columns. Both sexes at all ages and seasons distinctly spotted with white. Stature medium.

Distribution. Western portion of the Indian region.

Fig. 6.



Cervus (*Axis*) *axis*.

17. Cervus axis.

1877. *Cervus axis*, Erxl. Syst. Reg. An. p. 312.

1843. *Axis maculata*, Gray, Spec. Mamm. Brit. Mus. p. 178.

Range. British India; Ceylon.

(Pseudaxis, subgen.)

1872. *Pseudaxis*, Gray, Cat. Rumin. Mamm. Brit. Mus. p. 70.

Antlers about twice the length of the head, supported on short stout pedestals. Brow-antler (fig. 7, *a*, p. 908) rather short, directed upwards at a rather acute angle with the beam (fig. 7, *x*). A strong tine (fig. 7, *b*) is developed from the anterior surface of the antler at about half its entire length, and a short tine (fig. 7, *d*) from the posterior surface of its upper third.

Lacrymal pit of moderate depth and extent, its antero-posterior diameter being less than that of the three upper molars. Anteorbital vacuity moderate. Auditory bullæ moderately inflated, compressed, and smooth externally. Rudimentary upper canines present in both sexes. Rhinarium as in *Rusa*, with the exception of the internarial portion, which is slightly less prolonged upwards.

Metatarsal tuft whitish. Tail moderate. Neck maned. In summer spotted; in winter uniform brown. Black bands on each side of the pure white anal disk form a cross with the narrow black streak along the dorsum of the tail. Stature medium. Young indistinctly spotted.

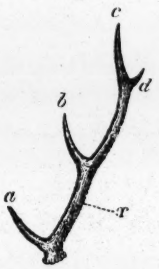
Distribution. Eastern Palæarctic region.

18. CERVUS SIKA.

1847. *Cervus sika*, Temm, et Schl. Jap. Mamm. p. 54, pl. 17.
1860. —— ——, Sclat. P. Z. S. 1860, p. 377.
1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 346, pl. 35.

Hab. Japan. Type Mus. Leyden.

Fig. 7.



Cervus (*Pseudaxis*) *sika.*

19. CERVUS EUOPIS?

1874. *Cervus euopis*, Swinh. P. Z. S. 1874, p. 151.

Hab. North China? Type, ♂, Zool. Soc. Menag.

The type, which is still living, differs in no appreciable external characters from ordinary specimens of *Cervus sika*. It was originally received from Tientsin, China. I have not included *C. euopis* among the synonyms of *C. sika*, in the hope of attracting further attention to the subject, as it would be of considerable interest should *C. sika* be found inhabiting the mainland as well as the islands of Japan.

20. CERVUS MANTCHURICUS.

1861. *Cervus pseudaxis*, Gray, P. Z. S. 1861, p. 236, pl. 27 (nec Eydoux et Souleyet?)[1].
1864. —— *hortulorum* et *mantchuricus*, Swinh. P. Z. S. 1864, p. 169.
1865. —— *mantchuricus*, Swinh. *in lit.* P. Z. S. 1865, p. 1.
1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 344, pls. 31, 32.
—— *mandarinus*, Alph. M.-Edw. Rech. Mamm. p. 184, pls. 22, 22 A.

Hab. Neighbourhood of Newchwang. Type, Mus. d'Hist. Nat. Paris.

[1] *Cf. infrà*, p. 909.

The Society has within the last few years received living specimens of a *Pseudaxis* from Japan, which are intermediate in size &c. between *P. sika* and *P. mantchuricus*. These have, in my opinion, with excellent judgment, been labelled by the Secretary as *Cervus mantchuricus minor*. I think it probable that, when a larger series, of Pseudaxine Deer are brought together, it will be found impossible to separate them into definite species, but that it will be found necessary to regard them as one species of wide geographical range, endowed with a constitution sufficiently elastic to enable it to support very varied conditions.

24. CERVUS DYBOWSKII?

1876. *Cervus dybowskii*, Tacz. P. Z. S. 1876, p. 123, fig.
—— *axis*? Radde, Reise im Süd. von Ost-Sib. Band i. p. 286.

Hab. Upper Ussuri (Mantchuria).

It is highly probable that, when we know more of this form, it will be found inseparable from *C. mantchuricus*.

22. CERVUS KOPSCHI?

1873. *Cervus kopschi*, Swinh. P. Z. S. 1873, p. 574.

Hab. Department of Kienchang, Kiangse, China (*Swinh.*). Types, Brit. Mus.

Also a very doubtful modification. I had an opportunity of examining the types upon their arrival, and could perceive no particulars in which they differ from *C. mantchuricus*.

23. CERVUS TAËVANUS.

1862. *Cervus taëvanus*, Sclat. P. Z. S. 1862, p. 152, pl. 16.
—— ——, Swinh. loc cit. p. 362.
1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 345, pls. 33, 34.

Hab. Mountains of Formosa.

24. CERVUS CASPICUS.

1874. *Cervus caspicus*, Brooke, P. Z. S. 1874, p. 42.

Hab. Mountains S.W. of the Caspian.

Since my original notice of this supposed species, I have received no further information respecting it. The antlers are in my private collection; and I am still unable to refer them to any known species. Although I have placed the species provisionally amongst the Pseudaxine Deer, I am very far from satisfied that this is its proper location. I am chiefly influenced in doing so by an antler I have lately received from Mr. Robertson (H.B.M. Vice-Consul, Busra) from the Karun, which is of decided Pseudaxine character, and may possibly belong to the same species. It is to be hoped that, through the indefatigable exertions of Mr. Robertson, we may ere long have the advantage of seeing this species living in the Society's Menagerie.

I have hesitated in referring the *Cervus pseudaxis* of Eydoux and Souleyet ('Voy. de la Bonite,' vol. i. p. 64, pl. 12) to any species of this subgenus. The specimen is still preserved in the Muséum d'His-

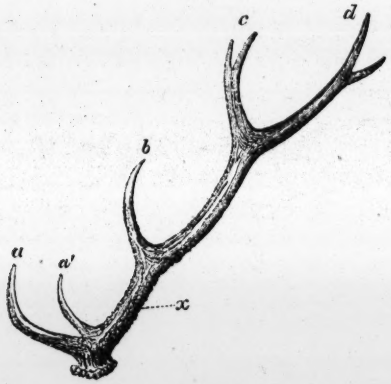
toire Naturelle at Paris; but though I have often carefully examined it, the absence of the skull and the great uncertainty of the locality where it was procured render it impossible to form a decided opinion.

(CERVUS, subgen.)

1766. *Cervus*, Linn. Syst. Nat. (ed. 12) p. 92.

Antlers differ from those of *Pseudaxis* in having a second brow-antler (fig. 8, *a'*) developed above the brow-antler (fig. 8, *a*), in the brow-antler being curved forwards at a right angle with the beam (fig. 8, *x*), and in the posterior coronal tine (fig. 8, *d*) being more strongly developed than the anterior coronal tine (fig. 8, *c*). Skull as in *Pseudaxis*. Molars sometimes with small supplementary columns.

Fig. 8.



Cervus (*Cervus*) *elaphus*.

Upper border of the internarial portion of the rhinarium forming an acute angle, with apex directed forwards. Infranarial portion of rhinarium not developed; the prænarial portion much constricted, but spreading out before joining the upper lip. Tail short. Neck maned. A patch of lighter colour than that of the body surrounds the tail. Stature large. Young spotted.

Distribution. Palæarctic and Nearctic regions.

25. CERVUS ELAPHUS.

1766. *Cervus elaphus*, Linn. Syst. Nat. (ed. 12) p. 93.

1837. —— *barbarus*, Benn. List An. Gard. Zool. Soc. 13th pub. p. 31 (sine descr.).

Range. Co. Kerry (Ireland); Cumberland; Devonshire; highlands of Scotland, and following islands—Harris, Skye, Rum, Mull, Jura, and Arran; island of Hitteren (Norway); Southern Sweden;

France; Spain; Germany; Austria; Turkey; Greece; Corsica; Sardinia; Province of Constantine (Algeria); Asia Minor; Caucasus.

A comparison of the gigantic antlers of the Red Deer of the 15th, 16th, and 17th centuries preserved in the old hunting Schloss at Moritzburg (built 1540), near Dresden, with the antlers of Red Deer from the islands of Harris or Sardinia, shows in a most striking manner the great variations to which this species is subject. Some of the antlers at Moritzburg measure 50 inches along the outside curve, are 10 inches in circumference round the smallest part of the beam, and the two antlers carry from 24 to 50 points. The spread between the coronal tines of one specimen is 74 inches. Antlers from Harris and Sardinia rarely exceed 30 inches in length, their circumference being about 4 inches; they very rarely carry a larger number than 12 points; and their span seldom exceeds 28 inches.

I have considered the African Deer, *Cervus barbarus*, specifically identical with *Cervus elaphus*. Specimens from Corsica and Sardinia completely bridge over the characters which have been advanced as distinctive of the African and European races. The second brow-antler is rarely developed in the African form; but I have known instances of its occurrence.

26. Cervus xanthopygus.

1831. *Cervus elaphus*, Pall. Zoogr. Rosso-Asiat. vol. i. p. 217.

1853. —— ——, Midd. Sib. Reis. Wirb., Band ii. Th. 2, p. 120.

1859. —— ——, Schrenck, Reis. u. Forsch. Amurlande, Band i. p. 170.

1862. —— ——, Radde, Reis. im Süd. v. Ost-Sib. Band i. p. 284.

1867. —— *xanthopygus*, Alph. M.-Edw. Ann. Sc. Nat. sér. 5, vol. viii. p. 376; Rech. s. l. Mamm. p. 181, pl. 21.

1876. —— *elaphus*, Prejevalsky, Mongolia (Engl. trans.), vol. i. p. 164.

Range. From the Caucasus to the Altai, and thence round Baikal through Dauria, as far as the Lena and Witim (*Pallas*); thence to the mountains surrounding the sources of the Silimdsha and Bureja (*Middendorff*); along the Amoor, as far eastwards as the Gorin and the Chelasso, and thence southwards to the sea-coast, a few days' journey south of the Bay of Kastries (*Schrenck*); Chinghan Mountains (*Radde*); Munniula Mountains (China, lat. of Pekin) (*Prejevalsky*).

Type, Mus. d'Hist. Nat. Paris.

This species was founded provisionally by Professor Alphonse Milne-Edwards upon the examination of a single specimen, certain cranial peculiarities and the large size of the anal disk deciding him that it was expedient for the time being to keep the form separate from *Cervus elaphus*. It is by no means certain that *Cervus xanthopygus* (should the species ultimately prove distinct from *Cervus elaphus*, which I greatly doubt) is the form found in all the localities above mentioned. The exact limits of the distribution eastwards of *Cervus elaphus*, *Cervus eustephanus* (Blanf.), and *Cervus maral*

(Ogilby) remain as yet unknown; and it is fully possible that the Deer met with by some of the celebrated travellers above quoted may have appertained to one or more of these species.

27. CERVUS EUSTEPHANUS.

1875. *Cervus eustephanus*, Blanf. P. Z. S. 1875, p. 638, fig.

Hab. Thian-Shan mountains.

This species is only known from its antlers, which are of immense size. Specimens which I have seen, in their great size and flattened crowns so closely resemble antlers of *Cervus canadensis* that it would be impossible to decide to which species they had belonged.

28. CERVUS MARAL.

1840. *Cervus maral*, Ogilby, Rep. Counc. Zool. Soc. 1840, p. 22.

1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 336, pl. 29.

Hab. Circassia, Persia.

Cervus maral differs in a marked manner from the allied species *C. elaphus* and *C. cashmeerianus* in the much greater length of its face, as shown by the table given below. The Red Deer of which the measurements are there given was a remarkably large old male. A pair of *Cervus maral*, which lived at large in one of my parks for some years, kept entirely apart from the Red Deer inhabiting the same park. They bred together; and during the rutting-season the species never showed the faintest desire to cross. This was the more remarkable as the old stag Maral, though considerably larger in size, lived in great fear of the Red Deer stags, which during that season roamed incessantly through the park in search of hinds, but at all times treated the female Maral with sovereign disdain, although at any moment they could have taken possession of her had they so desired.

The limits of the eastern range of *Cervus maral* are as yet undefined.

	Cervus maral.		*Cervus elaphus.*		*C. cashmeerianus.*	
	Eng. in.	metre	Eng. in.	metre	Eng. in.	metre
Total length of skull ...	18	0·457	16	0·405	16	0·405
From occ. prominence to ant. rim of orbit	7·6	0·193	7·5	0·190	7	0·178
From ant. rim of orbit to free extremity of the præmaxillæ.....	11	0·280	9	0·229	8·8	0·223
Length of upper molar and premolar series ...	5	0·127	4·5	0·114	4·5	0·114

29. CERVUS CASHMEERIANUS.

1839. *Cervus cashmeerianus*, Falconer, MS. (non vidi).

1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 339, pl. 30.

Hab. Cashmere.

The voice of the Cashmere Stag in the rutting-season differs greatly

from that of the Red Deer in the same season. In the former it is a loud squeal ending in a more guttural tone; in the latter it is a distinct roar resembling that of a Panther. The voice of the Wapiti resembles that of the *Cervus cashmeerianus*. The second brow-antler (fig. 8, *a'*) in *Cervus cashmeerianus*, with very rare exceptions, exceeds the brow-antler (fig. 8, *a*) in length, a peculiarity by which the antlers of this species may be distinguished from those of its allies.

30. CERVUS AFFINIS.

1835. *Cervus affinis*, Hodgs. Journ. As. Soc. Beng. vol. iv. p. 648, pl. 53. fig. 5.

1871. —— ——, Sclat. Trans. Z. S. vol. vii. p. 343.

Cervus wallichii, Cuv. Oss. foss. (ed. 4) tom. vi. p. 88; and F. Cuv. Hist. Nat. Mamm. pl. 356.

Hab. Choombi valley (Eastern Himalayas).

Should *Cervus wallichii*, Cuv., prove to be specifically identical with *Cervus affinis*, Hodgs., the former name, having priority, must stand. The antlers of the type of Cuvier's original description are, I believe, still preserved in the Museum of the Asiatic Society of Calcutta; F. Cuvier's plate shows them to be of decidedly abnormal growth.

31. CERVUS CANADENSIS.

1777. *Cervus canadensis*, Erxl. Syst. Règn. An. p. 305.

1857. *Cervus canadensis*, Baird, N. Am. Mamm. p. 638.

Range. Alleghany regions of Pennsylvania and Virginia, Northern Wisconsin?, Minnesota, Dakota, Nebraska, Washington, Oregon, and California; 57° N. is its northern limit (*Baird*).

(DAMA, subgen.)

1827. *Dama* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 306.

Antlers about twice the length of the head, palmated, the tines on the upper half of the antler rising from their posterior surface (figs. 9 and 10). Skull resembling that of *Cervus*, but more depressed, broader proportionally, and the orbits more prominent. Auditory bullæ subglobular; no upper canines; rhinarium as in *Cervus*. Tail moderate. Prepuce furnished with a tuft of long hair. Both sexes spotted in summer, unspotted in winter. Black markings on the rump and tail as in *Pseudaxis*. Stature medium. Young spotted.

Distribution. South-western Palæarctic region.

32. CERVUS DAMA.

1766. *Cervus dama*, Linn. Syst. Nat. (ed. 12) i. p. 93.

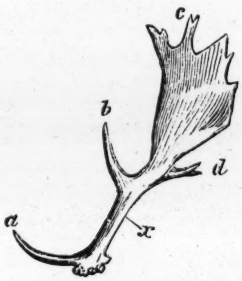
1843. *Dama vulgaris*, Gray, Spec. Mamm. Brit. Mus. p. 181.

1874. *Cervus dama*, Jeitt. Zool. Gart. 1874, p. 288, (translated by Sclater) Nature, vol. ii. p. 71; vide also Boyd Dawkins, *tom. cit.* pp. 112, 210, 226, and Brooke, *tom. cit.* p. 210, figures.

Range. Greece, Spain, Anatolia, island of Rhodes, Sardinia, N. Palestine; frontier of Tunis in Algeria? (fide *Loche*).

The semidomesticated life which the Fallow Deer has lead for so many generations in the parks of Europe has given rise to many permanent variations of colour. The natural colour of the species in a wild condition in summer is a brilliant fawn with white spots irregularly distributed over the upper parts of the sides and haunches, this spotted region being bounded inferiorly on the sides and posteriorly on the haunches by indefinite white lines. In winter the spots entirely disappear.

Fig. 9.



Cervus (Dama) dama.

Fig. 10.



Cervus (Dama) mesopotamicus.

33. CERVUS MESOPOTAMICUS.

1875. *Cervus* (*Dama*) *mesopotamicus*, Brooke, P. Z. S. 1875, p. 265, pl. 38. figs. 1, 2.

1876. —— ——, Brooke, P. Z. S. 1876, p. 298, figs. 1–4.

Hab. Luristan hills (Persia).

Since my description of the species, the Society has received two living specimens (♂ and ♀) from Mr. Robertson, to whom I was indebted for my original knowledge of its existence. *Cervus mesopotamicus* is a very much larger animal than *C. dama*.

B. Distal ends of metacarpi remaining. (Telemetacarpi.)

Posterior portion of the narial cavity not divided by the vomer into two distinct chambers.

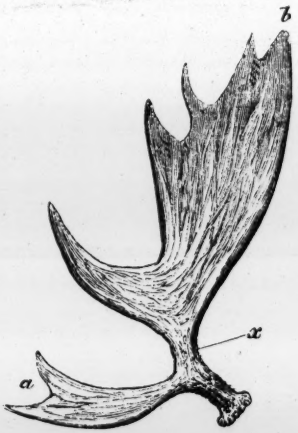
Tuft of hair on the external surface of the metatarsus when present above the centre of that bone. Tuft on inside of the tarsus absent.

4. Alces.

1827. *Alces* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 303.

Antlers dichotomous, both main branches palmated, the posterior branch (fig. 11, *b*) much surpassing the anterior branch (fig. 11, *a*) in dimensions. Anterior nares of great extent, owing to the shortness of the nasals. Lacrymal pit and anteorbital vacuity moderate.

Fig. 11.



Alces machlis.

Ascending rami of the præmaxillæ long, not articulating with the nasals. Incisors decreasing gradually in size from the central to the external pair.

A very small triangular rhinarium. Head very long, neck and body short, legs very long, stature great. Young unspotted.

Distribution. North Palæarctic and Nearctic regions.

ALCES MACHLIS.

1836. *Alces machlis*, Ogilby, P. Z. S. 1836, p. 135.
1834–7. —— *americanus*, Jard. Nat. Libr. xi. p. 125.

Range. Sweden, Lithuania? Northern Russia, Altai Mountains? mountains to the west of Lake Baikal. Apple Mountains (west of Chita), Khinghan Mountains; forests of the Lower Amoor as far south as the mouth of the Ussuri, in lat. 48° (*Radde*, &c.). "West coasts of America from the shores of the Arctic Ocean nearly to the Columbia River. Further east the northern limit is about 65° and thence through Canada to Maine, New Hampshire, Vermont, and the north parts of New York" (*Baird*).

5. HYDROPOTES.

1870. *Hydropotes*, Swinh. P. Z. S. 1870, p. 90.

Without antlers in either sex. Lacrymal pit deep, small, its antero-posterior diameter about equalling that of m. 3. Anteorbital vacuity moderate. Ascending rami of the præmaxillæ strong. Orbits small and but slightly prominent, their greatest diameter less than the extent of the three upper molars. Auditory bullæ considerably inflated, a portion intervening between the tympanohyal and the paroccipital process. Angle of lower jaw much produced backwards, forming a compressed semicircular prominence. Rami of lower jaw between the dental foramen and the incisors compressed and raised into sharp ridges, the edges of which are everted. Canines of immense size, in the male curved downwards, and gently convergent, pulp non-persistent. Rhinarium ample. No metatarsal tufts. Interdigital glands in hind feet deep, in fore feet slightly developed and shallow. Spigelian lobe of liver Rusiform (*fide* Garrod). Young spotted distinctly, from 3 to 6 at a birth. Stature small.

Distribution. Eastern Palæarctic region.

HYDROPOTES INERMIS.

1870. *Hydropotes inermis*, Swinh. P. Z. S. 1870, p. 89, pls. 6, 7.
1871. —— ——, Ham. P. Z. S. 1871, p. 258.
1877. —— ——, Garr. P. Z. S. 1877, p. 789.

Hab. Islands of the Yang-tse-Kiang.

6. CAPREOLUS.

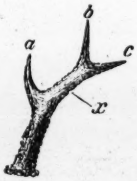
1827. *Capreolus* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 313.

Antlers less than twice the length of the head. Normal number of tines 6. Brow-antler (fig. 12, *a*) developed from the anterior surface of the upper half of the antler, directed upwards. Lacrymal pit very shallow and of small extent. Anteorbital vacuity small. Ascending rami of the præmaxillæ articulating generally but not invariably with the nasals. Auditory bullæ very slightly inflated, their external surface rugose. Angle of lower jaw as in *Hydropotes*. Crowns of central incisors moderately expanded.

Upper margin of the internarial rhinarium running straight across from the upper angle of the nostrils. No infranarial rhinarium. Tail very short. In the female the clitoris is surrounded by a long tuft of hair. Interdigital glands in the fore feet rudimentary, in the hind feet deep, opening by a narrow orifice into a capacious round pouch. Stature small. Young spotted.

Distribution. Central and Western Palæarctic region.

Fig. 12.



Capreolus capræa.

1. CAPREOLUS CAPRÆA.

1843. *Capreolus capræa*, Gray, Cat. Spec. Mamm. Brit. Mus. p. 176.

1844. *Capreolus europæus*, Sund. Pec., Vetensk. Akad. Handl. 1844, p. 184.

Range. Scotland, Southern Sweden, France, Germany, Austria, Hungary, Spain, Tuscany, Greece, Turkey, Northern Palestine, Elburz Mountains (South of Caspian).

I have received a specimen from the last-mentioned locality which differs in no respect from the European specimens.

2. CAPREOLUS PYGARGUS.

1771. *Cervus pygargus*, Pall. Reise Russ. Reichs, vol. i. p. 97, Append. p. 453.

1831. *Cervus capreolus*, Pall. Zoogr. Rosso-As. vol. i. p. 219.

1853. —— ——, Midd. Sib. Reis. Wirb. Band ii. Th. 2, p. 118.

1859. —— ——, Schrenck, Reis. u. Forsch. Amurlande, Band i. p. 163.

1862. —— ——, Radde, Reise Süd. v. Ost-Sib. Band i. p. 277.

Range. Suitable localities in the mountains forming the watershed between the Russian and Chinese empires, in Central Asia; Chingan Mountains (Mantchuria).

Most authors have considered *C. pygargus* to be a large variety of the common Roe. There are, however, in the British Museum two specimens purchased from Brandt and said to be from Siberia, which, in their very much larger size, larger anal disk, and much more hairy ears, differ widely from all specimens of the common species. Specimens of Roe from Mantchuria in the British and Paris Museums are very much smaller than the above-mentioned

specimens; they also differ from the larger specimens and the common Roe in some details of coloration. It is not improbable that the Mantchurian Roe may prove to be a third modification of the form.

C. Distal ends of the lateral metacarpals remaining. (TELEMETACARPI.)

Posterior portion of the nasal chamber divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, below the centre of that bone. Tuft on the inside of the tarsus frequently present.

Ascending rami of the præmaxillæ not reaching the nasals. (Exception, subgen. *Furcifer*.)

7. CARIACUS.

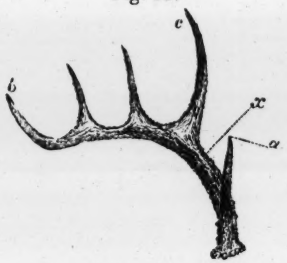
(CARIACUS, subgen.)

1827. *Mazama* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 314 (nec Rafinesque)[1].

1850. *Cariacus*, Gray, P. Z. S. 1850, p. 237.

Antlers not greatly exceeding the head in length, on short pedestals. A short upright brow-antler (fig. 13, *a*) rises from the inner surface of the lower third of the antler some little distance above the burr. The antlers are curved boldly forwards, downwards, and inwards, one or more tines being developed from their

Fig. 13.



Cariacus (*Cariacus*) *virginianus*.

convex or posterior surface. Skull elongated and narrow. Lacrymal pit of moderate extent, owing to the very large anteorbital vacuity, which encroaches on the region usually occupied by the facial plate of the lacrymal. Nasals forming the larger part of the superior border of the anteorbital vacuity. Auditory bullæ slightly inflated. No upper canines; molars sometimes with small supplementary columns; central incisors but slightly spatulate. A tuft of long

[1] *Mazama*, of Rafinesque (1817), is too ill-defined to be used for either the Rocky-Mountain Sheep or the Pronghorn; but its publication invalidates its subsequent use in any other sense. *Cf.* Baird, N.-Am. Mamm. p. 665.

hair on the inner surface of the limb at the tarsal joint. Rhinarium as in *Cervus*. Tail long. Stature medium. Young spotted.

Distribution. Nearctic and northern portions of the Neotropical region.

(*a*) *Antlers non-dichotomous. Lacrymal of moderate depth.*

1. CARIACUS VIRGINIANUS.

1774. *Cervus virginianus*, Bodd. Elench. An. vol. i. p. 136 (non vidi).
1788. —— ——, Gm. L. Syst. Nat. p. 179.
1857. —— ——, Baird, N.-Amer. Mamm. p. 643, figs. 12, 13.

Range. From Maine all over the United States east of the Missouri (*Baird*).

2. CARIACUS LEUCURUS.

1829. *Cervus leucurus*, Dougl. Zool. Journ. vol. iv. p. 330.
1857. —— ——, Baird, N.-Amer. Mamm. p. 649, figs. 14–18.
1873. —— ——, Walsingham, P. Z. S. 1873, p. 561.

Range. N. California, Oregon principally east of the Cascade Mountains (*Walsingham*), Washington, Dakota west of the Missouri, Nebraska (*Baird*).

3. CARIACUS MEXICANUS.

1827–1834. *Cervus mexicanus*, Licht. Darst. d. Thiere, Taf. 18.
1827. *Cervus nemoralis*, Ham. Sm., Griff. An. Kingd. vol. iv. p. 137, plate.
1857. —— ——, Baird, N.-Amer. Mamm. 653.

Range. Texas, Mexico, Sonora (*Baird*); Guatemala, Honduras, Nicaragua (*Salvin*); Costa Rica (*Saussure*); Panama (*Salvin*).

Lichtenstein's types, ♂ et ♀ Mus. Berlin.

The name *Cervus mexicanus* was originally given by Gmelin (Syst. Nat. p. 179) to the Mexican deer of Pennant, described in his 'Quadrupeds,' p. 110. The description and dimensions given by Pennant are reconcilable with the *Cervus mexicanus* of Lichtenstein; but the antlers figured by him (plate xi. figure 3) are certainly not referable to the same form. They appear rather to represent abnormal antlers of *Cariacus macrotis*. The specimens described by Lichtenstein were obtained by Graf von Sack in Mexico, and are in all particulars thoroughly typical of the Deer inhabiting the localities I have given in the range of this species.

I give the dimensions of a female specimen collected by Mr. Salvin in Guatemala, and of the antlers of a male collected by the same gentleman in the same locality. The latter resemble in every particular antlers collected by Mr. Salvin in Nicaragua and Panama. There are not more than six points, inclusive of the brow-antler, on both antlers in any of the specimens collected between Guatemala and Panama; but I have seen specimens from Mexico and Texas with eight and ten tines; and one splendid specimen collected by Mr. Dresser near Friedrichsburg in Texas has as many as fifteen.

The Texan deer are decidedly larger than those inhabiting Guatemala, Nicaragua, and Panama.

Dimensions of *Cariacus mexicanus*.

	Engl. inches.	Metre.
♀ Height at shoulder	27·5	0·700
Length of ears	4·3	0·110
Length of tail exclusive of hair.....	5·5	0·140
Total length of skull in a straight line	9·0	0·230
Length from ant. rim of orbit to free extremity of præmaxillæ	4·5	0·114
Length of molar and premolar series (upper)	2·7	0·067
♂ Length of antlers	7·5	0·190
Greatest span.....	8·2	0·210

4. CARIACUS SIMILIS?

1852. *Cervus similis*, Puch. Nouv. Arch. du Mus. 1852, p. 357, pl. 26.

Hab. Unknown. Type, ♂ Mus. d'Hist. Nat. Paris.

5. CARIACUS SAVANNARUM.

1848. *Cervus savannarum*, Cab. & Schomb. Reis. Brit. Guian. vol. iii. p. 785.

1852. *Cervus gymnotis*, Puch. Nouv. Arch. du Mus. 1852, p. 348, pl. 25, pl. 23. figs. 2–10.

Hab. Guiana, Venezuela? Type, ♂ Mus. Berlin.

6. CARIACUS PERUVIANUS.

1874. *Coassus peruvianus*, Gray, Ann. & Mag. Nat. Hist. (ser. 4) vol. xiii. p. 332.

Hab. Peru. Types, ♀ Brit. Mus., ♀ in my own collection.

The number of specimens from well-authenticated localities at present existing in European collections is far too small to enable me to form any decided opinion respecting the degree of persistency of modification in the above-mentioned forms. Notwithstanding, I think it highly probable that when we possess a sufficiently large series we shall find that *C. peruvianus* and the four preceding species are nothing more than climatic varieties of *C. virginianus*, connected inseparably by every shade of intermediate forms. Mr. Allen, in his valuable paper on the geographical variation of North-American Mammals, especially in respect to size (Bull. U.S. Survey, 1876, p. 304), has conclusively proved that a decrease in size and characteristic development takes place in all mammals the centre of whose area of distribution is in North America, as they spread southwards; and, so far as the materials at my command enable me to judge, I think it probable that the characters upon which *C. leucurus*, *C. mexicanus*, *C. similis*, *C. savannarum*, and *C. peruvianus* have been established as species may be in large measure the result of this law.

7. CARIACUS GYMNOTIS.

1833. *Cervus gymnotis*, Wiegm. Isis von Oken, p. 965.

Hab. New Granada. Type, ♂ Mus. Berlin.

This is, I think, a distinct species. The large drooping ears (naked externally), the very narrow head, and the remarkably slender, delicate form of the animal render it easily distinguishable from specimens of the allied species.

8. CARIACUS TOLTECUS.

1860. *Cervus toltecus*, Sauss. Rev. et Mag. Zool. (ser. 2) tom. xii. p. 247.

Hab. Vera Cruz.

M. Saussure gives 6·9 inches as the total length of the skull of his type specimen, which was a male of at least two years of age, as evidenced by his antlers, which are not those of the first year. If this measurement is correct, *Cariacus toltecus* is a very small species, one third smaller than *C. mexicanus* from the same locality.

(β) *Antlers dichotomous. Lacrymal pit deep.*

9. CARIACUS MACROTIS.

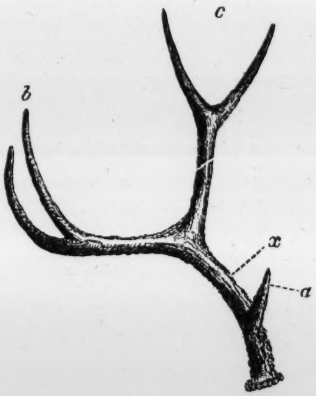
1823. *Cervus macrotis*, Say, Narr. Long's Exp. vol. ii. p. 88.

1857. —— ——, Baird, N.-Amer. Mamm. p. 656.

1873. —— ——, Walsingham, P. Z. S. 1873, p. 561.

Range. Oregon, Nebraska, Dakota west of the Missouri, Colorado, Kansas.

Fig. 14.



Cariacus (*Cariacus*) *macrotis*.

10. CARIACUS COLUMBIANUS.

1829. *Cervus macrotis*, var. β. *columbianus*, Rich. Faun. Bor.-Am. p. 257.

1848. *Cervus lewisii*, Peale, Mamm. Birds U.S. Expl. Exp. p. 39 (fide Baird).

1850. *Cariacus punctulatus*, Gray, P. Z. S. 1850, p. 239, pl. 28.

1857. *Cervus columbianus*, Baird, N.-Amer. Mamm. p. 659.

Range. California, Oregon, and Washington west of the Cascade Mountains.

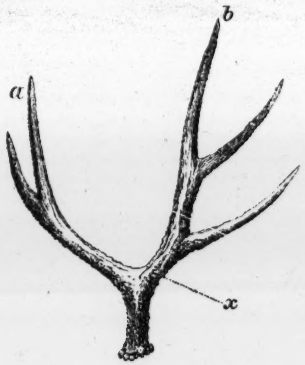
This species is about one third smaller than *C. macrotis*, which it otherwise closely resembles. The two species are found on the same ground in Washington.

(Blastocerus, subgen.)

1850. *Blastocerus*, Gray, P. Z. S. 1850, p. 237.

Antlers slightly exceeding the head in length, on short pedestals. They are dichotomous, the anterior branch (figs. 15 and 16, *a*) inferior to the posterior branch (*b*) in development. In adult specimens the former sometimes, the latter always bifurcates. Lacrymal

Fig. 15.



Cariacus (*Blastocerus*) *paludosus.*

pit deep. Skull in all essential particulars resembles that of *Cariacus*. Central incisors very slightly spatulate, and exceeding the pair next to them but slightly in size. Tail short. No metatarsal tuft. Tarsal tuft present.

Distribution. Central and Southern Neotropical region.

11. Cariacus paludosus.

1820. *Cervus paludosus*, Desm. Mamm. p. 443.

—— ——, Licht. Darst. pl. 17 (1827–1834).

1872. —— ——, Hensel, Beitr. Kenntn. Säug. Süd-Bras. p. 95.

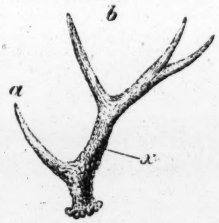
Range. South Brazil, Paraguay, Rio Grande do Sul, Uruguay.

12. Cariacus campestris.

Cervus campestris, F. Cuv. Dict. Sc. Nat. tom. vii. p. 484.
—— ——, Licht. Darst. pl. 19 (1827–1834).
—— ——, Hensel, Beitr. Kenntn. Säug. Süd-Bras. p. 96 (1872).

Range. Paraguay, Uruguay, Buenos Ayres, N. Patagonia.

Fig. 16.



Cariacus (*Blastocerus*) *campestris*.

(Furcifer, subgen.)

1850. *Furcifer*, Gray, P. Z. S. 1850, p. 236.

Antlers the length of the head, with a strong brow-antler (fig. 17, *a*) curved forwards and upwards at a right angle to the simple beam (fig. 17, *x*), which is gradually attenuated to a sharp point. The entire beam is curved gently forwards. Lacrymal pit deep, but of moderate antero-posterior extension. Auditory bullæ very slightly

Fig. 17.



Cariacus (*Furcifer*) *antisiensis*.

inflated, their external surface rugose. Ascending rami of the præmaxillæ articulating with the nasals. Free extremities of the nasals forming together a single point. Central incisors very slightly exceeding the pair next to them in size, and but slightly spatulate. Upper canines in both sexes. Rhinarium as in *Cariacus*. Stature medium.

Distribution. South-western Neotropical region.

13. Cariacus chilensis.

1846. *Cervus chilensis*, Gay et Gerv. Ann. d. Sc. Nat. 1846, p. 91.
1849. *Capreolus leucotis*, Gray, P. Z. S. 1849, p. 64, Mamm. pl. 12.

1875. *Cervus chilensis*, Sclat. P. Z. S. 1875, p. 45, figure.

Range. Andes "from Magellan to near Santiago, but far more rare in the north than in the southern portion of its range" (Reed, P. Z. S. 1875, p. 44). Type, ♀ Mus. d'Hist. Nat. Paris.

14. CARIACUS ANTISIENSIS.

1834. *Cervus antisiensis*, D'Orb. Nouv. Arch. du Mus. iii. p. 91.
1869. *Anomalocera huamel*, Gray, Scient. Opin. 1869, p. 384.
1869. *Xenelaphus huamel*, Gray, P. Z. S. 1869, p. 497.
1872. *Xenelaphus leucotis*, Gray, Cat. of Rum. Mamm. p. 89.
1872. *Xenelaphus anomalocera*, Gray, Ann. Nat. Hist. (ser. 4) vol. x. p. 445.
1873. *Xenelaphus chilensis*, Gray, Ann. Nat. Hist. (ser. 4) vol. xii. p. 161.
1874. *Furcifer chilensis*, Gray, Ann. Nat. Hist. (ser. 4) vol. xiii. p. 332.
1875. *Cervus antisiensis*, Sclat. P. Z. S. 1875, p. 46.

Range. Peruvian Andes. Type, ♂ Mus. d'Hist. Nat. Paris.

Naturalists owe a debt of gratitude to Mr. Sclater for the care and clearness with which he has unravelled the meshes of confusion in which the synonymy of the two very distinct species, *Cariacus chilensis* (Gay) and *C. antisiensis* (D'Orb.), was formerly enveloped. There is not the smallest foundation for a third species of *Furcifer*. The type of *Xenelaphus leucotis*, &c. of Dr. Gray is preserved in the British Museum, and is undoubtedly nothing but a very fine old male *C. antisiensis* with strongly developed abnormal antlers.

(COASSUS, subgen.)

1827. *Subulo* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 318[1].
1850. *Coassus*, Gray, P. Z. S. 1850, p. 240.

Antlers simple spikes not exceeding half the length of the head (fig. 18). Skull resembling that of *Cariacus*, the auditory bullæ less inflated and the facial profile more arched. Molars sometimes

Fig. 18.



Cariacus (*Coassus*) *rufus*.

with supplementary columns. Canines of uncertain occurrence. Rhinarium ample, resembling that of *Cervulus*. No metatarsal tuft. Tarsal tuft present. Stature small. Form heavy, with the back much arched. Young spotted.

Distribution. Neotropical region.

[1] If this name, which has been totally unused, were to be revived, it would take precedence of *Cariacus* as the title of the whole genus. But it is too close to *Subula* (Mollusca) of Schumacher, 1817.

15. CARIACUS RUFUS.

1817. *Cervus rufus*, F. Cuv. Dict. Sc. Nat. vol. vii. p. 485.

Hab. Surinam. Types, Mus. d'Hist. Nat. Paris, ♀ ad. (No. in Cat. 532), young (No. in Cat. 527).

16. CARIACUS SIMPLICICORNIS.

1827. *Cervus simplicicornis*, Ham. Sm., Griff. An. Kingd. vol. v. p. 318.

Hab. Brazil (*St.-Hilaire, Lalande*), New Granada (*Brooke*). Types:—Mus. d'Hist. Nat. Paris, ♀ (No. 525 in Cat.); skull of same, Mus. d'Anat. Comp. Paris (in Cat. 2208); skull of ♂ collected by St.-Hilaire, in Mus. Anat. Comp. (in Cat. 2225).

17. CARIACUS RUFINUS.

1851. *Cervus rufinus*, Puch. Arch. du Mus. p. 491, pl. 30; id. Rev. Mag. Zool. 1852, p. 561.

Hab. Ecuador (*Pucheran*), Guatemala (*Salvin*). Type, ♂ Mus. d'Hist. Nat. Paris.

18. CARIACUS NEMORIVAGUS.

1817. *Cervus nemorivagus*, F. Cuv. Dict. Sc. Nat. vol. vii. p. 485.

Hab. Surinam. Types, stuffed head of ♂ and skull of same (Cat. 2223), Paris, in Mus. d'Hist. Nat. and Mus. d'Anat. Comp.

I append a table of the comparative measurements of the four last-mentioned species. The cranial measurements are taken from adult females.

	C. rufus.		*C. simplicicornis.*		*C. rufinus.*		*C. nemorivagus.*	
	Engl. inches.	metre.	Engl. inches.	metre.	Engl. inches.	metre.	Engl. inches.	metre.
Height at shoulder ...	27	0·685	21	0·535	19	0·485	19	0·485
Total length of skull in a straight line ...	9·2	0·235	7·10	0·200	6·5	0·165	6·2	0·157
From anterior rim of orbit to free extremity of præmaxillæ	4·9	0·124	3·10	0·098	3·3	0·083	3·1	0·078
Length of upper molar and premolar series	2·7	0·068	2·3	0·058	2·1	0·053	2	0·050
Greatest width between the orbits, measuring from the lower rim	3·6	0·090	3·2	0·080	3·	0·076	2·7	0·068

From this it will be seen that *Cariacus rufus* is considerably the largest, and *C. nemorivagus* the smallest and most delicately formed species. *C. rufus* is red at all ages, and very heavily built. *C. simplicicornis* is brown when young, never attains so brilliant a colour as

C. rufus, and is much more gracefully shaped. *C. rufinus*, when adult, is of a beautiful shining red, with the face and fore limbs strongly shaded with bluish brown, as shown in exaggeration in Pucheran's figure (*vide suprà*); and *C. nemorivagus* is of a dull pepper-and-salt brown, and never becomes red at any age.

19. CARIACUS SUPERCILIARIS.

1850. *Coassus superciliaris*, Gray, P. Z. S. 1850, p. 242, pl. 25.
Hab. Brazil (fide *Gray*).

20. CARIACUS WHITELYI.

1873. *Coassus whitelyi*, Gray, Ann. & Mag. Nat. Hist. (ser. 4) xii. p. 163; id. Hand-list Edent. &c. 1873, p. 162, pl. 32. fig. 2.
Hab. Peru. Founded on a single skull of an immature animal in Brit. Mus. (No. in Cat. 73. 6. 27. 2).

It is now many years since I commenced the study of this difficult group of Cervidæ; but although I have examined the specimens contained in nearly all the continental museums, and made a private collection of some importance, I must confess that I am still far from a satisfactory understanding of the subject. The complete absence of cornual and cranial characters renders it exceedingly difficult to grasp the characteristic peculiarities of the different modifications of the form, six or seven of which are, I think, probably persistent, and worthy of specific recognition by naturalists. In the above list I have enumerated all the species (or supposed species) of which the types are extant, and must leave it to the future to decide whether they are valid or not. There is still much valuable work to be done amongst the Cervidæ by collectors in South America, well-authenticated specimens from Rio Grande do Sul, Paraguay, South Brazil and Bolivia being almost a blank in European museums. The type of *Coassus auritus*, Gray, not having been preserved, I have omitted the name from my list, as without the type it will be impossible to decide with any certainty upon what species Dr. Gray's name was conferred.

8. PUDUA.

1850. *Pudu* (subgen.), Gray, P. Z. S. 1850, p. 242.

Antlers minute simple spikes. Lacrymal pit oval, very deep, its antero-posterior extent slightly exceeding m. 3. Ascending rami of the præmaxillæ reaching the nasals, which are considerably expanded between the moderate anteorbital vacuities. Auditory bullæ as in *Coassus*. Molars without supplementary columns. Canines absent. Central incisors slightly expanded, but exceeding those external to them very much in size. Muzzle as in *Cervulus*, but with the internarial and infranarial portions less extensive. Neither tarsal nor metatarsal tufts. Ectocuneiform, navicular, and cuboid bones in tarsus united. Stature very small.

Distribution. Chilian Andes.

PUDUA HUMILIS.

1831. *Cervus humilis*, Benn. P. Z. S. 1831, p. 27,
1871. *Cervus pudu*, Sclat. P. Z. S. 1871, p. 238, pl. 17.
Hab. Chilian Andes.

9. RANGIFER.

1827. *Rangifer* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 304.

Antlers developed in both sexes; a strong brow-antler (fig. 19, *a*) is developed sometimes on both, but more frequently on only one antler, that on the other being a mere rudiment. The brow-antler, when fully developed, is directed downwards parallel with the face and palmated anteriorly. A short distance above the brow-antler another similar tine (fig. 19, *b*) is developed. Above this the antler forms a bold curve, the concavity forwards, its extremity (fig. 19, *c*) is palmated; and a short tine (*d*) is developed from its posterior surface at half

Fig. 19.



Rangifer tarandus.

its length. Portion of the skull anterior to the horns elongated, that posterior to it remarkably short. Lacrymal pit and anteorbital vacuity of moderate dimensions, the former shallow. Nasals much expanded posteriorly. All the teeth remarkably small in proportion to the skull; the incisors decrease very gradually in size from the central to the external pair, they are none of them spatulate. Vomer produced backwards nearly as far as the basilar suture. Frontal

process for the support of the antlers carried back into the parietals, this region of the skull being much restricted. No rhinarium.

Ears and tail short, neck maned, stature large. Young unspotted.

Distribution. Northern Nearctic and Palæarctic regions.

RANGIFER TARANDUS.

1766. *Cervus tarandus*, L. Syst. Nat. (ed. 12) p. 93.

1829. *Cervus tarandus* et var. *artica* et *sylvestris*, Rich. Faun. Bor.-Am. pp. 238–251 (1829).

1857. *Rangifer caribou* et *R. grœnlandicus*, Baird, N.-Amer. Mamm. pp. 633, 634; American Reindeer, Hardy, 'Forest Life in Acadie,' pp. 120–163.

Range. Norway, Lapland, Spitzbergen, Nova Zembla, Western Siberia from the Arctic Sea, about as far south as lat. 60° in Eastern Siberia, to lat. 55° in the Yablonoi Mountains, to lat. 49° on the Japanese sea-coast, and to lat. 46° on the island of Saghalien; Russian America from the Arctic Sea, somewhat further south than the Arctic circle? British America from Melville Island to Great Slave Lake in the west, and in the east from Labrador to Nova Scotia, Greenland, Newfoundland.

There are many well-marked varieties of Reindeer in this wide and varied range; but the study of a considerable series has only shown me the difficulty, if not impossibility, of defining them; and consequently I have been constrained to include all under one title in this synopsis, although I think the differentiation of the form according to latitude and locality merits further attention.

EXPLANATION OF PLATE LV.

Fig. i. Left fore limb of *Capreolus capræa*, selected as an example of the TELEMETACARPI.

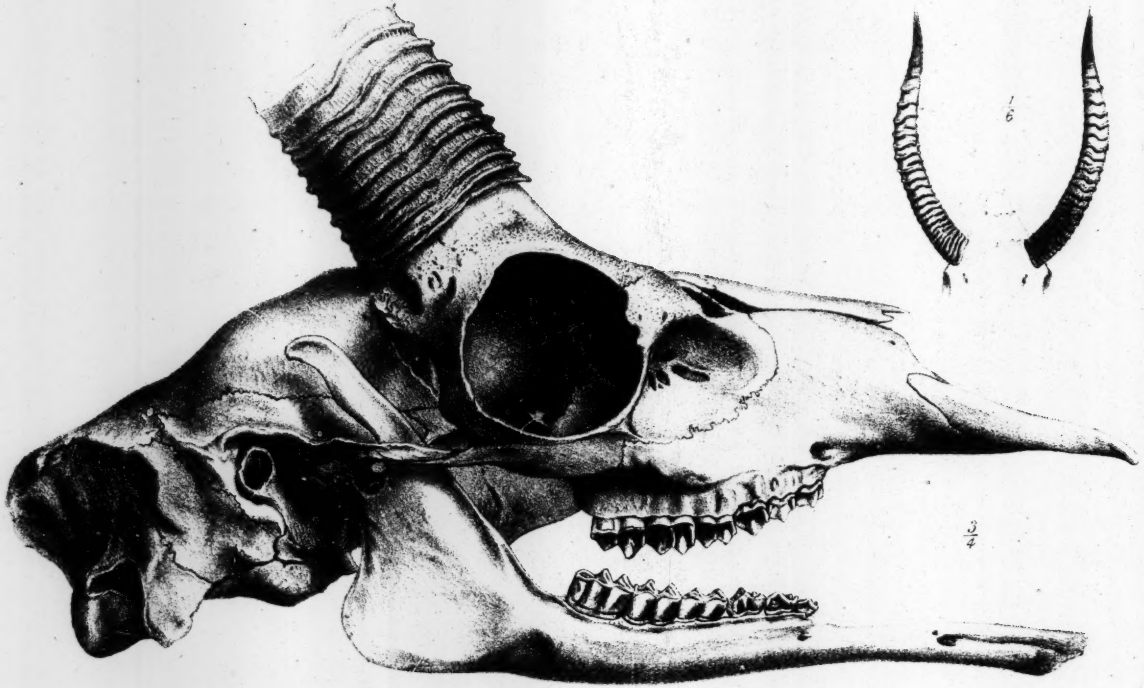
3. Metacarpal cannon, seen from the inside. 4. Ditto, seen from the outside. 3′, 4′. Phalanges of the 3rd and 4th metacarpals, which coalesce to form the metacarpal cannon. 2–5. Distal extremities of the 2nd and 5th metacarpals. 2′–5′. Their respective phalanges. *r*–*r*′. Place of origin and insertion of the round ligament which prevents the upward displacement of the 2nd and 5th metacarpals. *t*. Trapezium. *tr* and *o*. Confluent trapezoid and os magnum. *u*. Unciform.

ii. Left fore limb of *Cervus elaphus*, selected as an example of the PLESIOMETACARPI.

2, 5. Proximal extremities of the 2nd and 5th metacarpals. *s*. Metacarpo-phalangeal sesamoids. *p*. Proximal phalanges of 2nd and 5th digits. (The remainder of the lettering as in fig. i.)

iii. Antler of the present Castle-Caldwell Fallow Deer, showing the excessive development of the tine, *d*, and consequent contraction of the palm, *c*.

iv. Antler of one of the males from which the Castle-Caldwell herd of Fallow Deer are descended.


1/6
3/4

2. On a new Species of Gazelle from Western Africa. By Sir Victor Brooke, Bart., F.Z.S.

[Received November 19, 1878.]

(Plate LVI.)

I have the pleasure of bringing before the notice of the Society a new and exceedingly interesting form of Gazelle. As is well known, the different species into which the genus *Gazella* is divisible (vide P. Z. S. 1873, p. 535) resemble each other so closely that it is often very difficult to define them. The differences exist in nature, let their taxonomic value be what it may; but in many cases they absolutely baffle verbal description.

In the form at present under consideration there is no such difficulty. Although the materials at my command consist only of the skulls of three males, with a small portion of the skin of the head attached to one of them, characters are apparent which separate the form from all known Gazelles. Indeed my only doubt is as to whether the species should not constitute the type of a new subgenus. The specimens belong to Mr. Gerald Waller, and it is through his courtesy that I have the opportunity of exhibiting them this evening. Mr. Waller tells me that the skulls were procured on the mainland of Africa, north of the island of Zanzibar, about lat. 3° S. and long. 38° E. He is unfortunately unable at present to give any further particulars respecting the species.

The new Gazelle differs from all hitherto described species in the very great backward prolongation of the occiput. This extension is is principally gained by the great size of the supraoccipital bone and the prominence of the occipital crest. The skull is much more depressed, the facial axis forms a more obtuse angle with the cranial axis, and the rami of the lower jaw are more slender than in any known Gazelle. The ascending rami of the præmaxillæ are remarkably thick, and do not nearly reach the nasals. In all other Gazelles the molars and premolars are decidedly hypsodont; in the new species they are as decidedly brachyodont, and, in comparison with the skull, remarkably small. The horns do not differ greatly from those of *Gazella dorcas*; they are, however, more massive and more laterally compressed. The skin of the head is of a uniform foxy red, with white marks under the eye. Mr. Waller has expressed a desire that the species should be named after his brother, who lost his life in Africa. I have therefore much pleasure in proposing the name *Gazella walleri* for the new form.

The following table of the comparative dimensions of *Gazella walleri* and *Gazella dorcas*, and the Plate (LVI.), will render further description unnecessary.

	G. walleri ♂.		*G. dorcas* ♂.	
	English inches.	metre.	English inches	metre.
Total length of skull	9·2	0·234	7·5	0·190
From anterior rim of orbit to free extremity of the præmaxillæ	4·3	0·108	3·6	0·090
From anterior rim of orbit to the occipital protuberance	6·0	0·152	4·0	0·101
From centre of the external auditory meatus to occipital protuberance	2·4	0·061	1·0	0·025
From the centre of external auditory meatus to posterior rim of orbit	1·9	0·046	1·6	0·041
Length of the præmaxillæ	2·1	0·053	2·2	0·055
Length of basicranial axis	3·7	0·093	2·8	0·071
From inferior rim of orbit to alveolus of third upper molar	·9	0·022	1·1	0·028
Greatest depth of the rami of the lower jaw in the portion underlying the molars	·6	0·015	·8	0·020
Length of diastema of the lower jaw	2·1	0·053	1·4	0·035
Length of upper molar series	1·15	0·029	1·4	0·035
„ „ „ premolar series	·8	0·020	·8	0·020
„ „ lower molar series	1·3	0·032	1·5	0·038
„ „ „ premolar series	·7	0·018	·8	0·020
Length of horns round the curve	12·0	0·305	9·0	0·230
Their circumference	4·4	0·111	3·8	0·096

3. Notes on the Anatomy of *Indicator major*. By A. H. Garrod, M.A., F.R.S., Prosector to the Society.

[Received October 25, 1878.]

Through the kindness of Mr. R. B. Sharpe I have had the opportunity of examining a spirit-preserved specimen of *Indicator major*, from Fantee, which enables me to lay before the Society some fresh facts in its anatomy confirmatory of its non-Cuculine affinities.

In his contributions to Orr's edition of Cuvier's 'Animal Kingdom' (1840), the late Mr. E. Blyth referred the Honey-guides to the Woodpeckers as their nearest allies[1]; and this idea was expanded by him two years later in the Journal of the Asiatic Society of Bengal[2]. In 'The Ibis' for 1870[3], Mr. Sclater brought forward fresh facts in proof of the non-Cuculine affinities of the genus, and proposed to place it next to the Capitonidæ, with which, or with the Coliidæ, Mr. Blanford also in the same year showed it had its nearest relationships[4].

The following observations tend to prove the correctness of the conclusions arrived at by the two last-mentioned ornithologists, and the error of imagining that *Indicator* is related to the Cuculidæ.

[1] *Loc. cit.* p. 215. [2] Vol. xi. p. 167, 1842. [3] p. 176.
[4] Observations on the Geology and Zoology of Abyssinia, 1870, p. 308.

Pterylosis.—This has been recorded by Nitzsch in his 'Pterylography;' and it seems more than strange that the characteristically Picine distribution of its feather-tracts did not lead that able ornithologist to recognize its true relationships. He retained it among the Cuculidæ.

My study of Pterylography has led me to look upon the nature of the dorsal tract as all-important in determining to which great group of Birds, the Homalogonatæ or Anomalogonatæ [1], any doubtful family belongs. When the dorsal tract develops a fork *between* the shoulder-blades a bird is homalogonatous; when the tract runs on unenlarged to near the lower ends of the scapulæ, then it is anomalogonatous. Again, among the Anomologonatæ, when the pectoral tract bifurcates into an outer and an inner branch just after commencing on the chest, then the bird is one of the Piciformes, and has a tufted oil-gland; when the pectoral tract does not bifurcate at all, or only at the lower end of its pectoral portion, but is only increased in breadth instead, then the bird is Passeriform [2], and has a naked oil-gland. Exceptions to these rules scarcely exist.

In that the dorsal tract of *Indicator* does not form a fork, but remains narrow, between the shoulder-blades, it is anomalogonatous —the Cuculidæ being homalogonatous; in that it possesses a free outer pectoral band to the anterior tract, it is a Piciform bird. The oil-gland is also tufted.

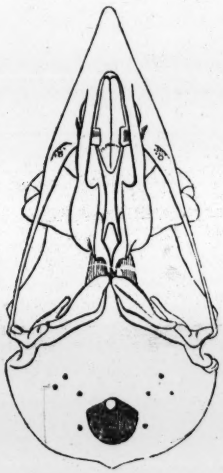
A careful examination of the skin proves that the genus agrees more closely in its feather-tracts with the Picidæ, Capitonidæ, and Ramphastidæ than Nitzsch's figures would tend to prove. To me it is evident that there is a communication between the thoracic extremity of the inferior neck-tract and the upper extremity of the humeral tract, as in the Picidæ, Capitonidæ, and Ramphastidæ. Again, in the three groups just named there is a great weakness or an entire disappearance for a short distance of the dorsal tract towards the lower extremity of the interscapular region. In *Indicator* this same weakness exists; so that, with the exception of a single feather in the middle line, the appearance of the region in question is much more like the arrangement in *Ramphastos* than in Nitzsch's figure of the genus. On the ventral surface of the fleshy tail I find a median subcircular space surrounded by feathers, as in the Picidæ and Ramphastidæ, as well as in the Capitonidæ apparently. The caudal termination of the dorsal tract agrees with the account given by Nitzsch. I could find no trace of a duplication of the lumbar tract. In the possession of twelve rectrices *Indicator* differs from the Capitonidæ and Ramphastidæ, which have ten, like the Picidæ.

Skeleton.—The specimen of the skull of *Indicator* examined by Professor Huxley [3] at Mr. Sclater's request was too imperfect for exact description. The considerable interval between the maxillopalatines is recorded by him. I am now able to add that the vomer

[1] *Vide* P. Z. S. 1874, p. 116, for definition of these terms.
[2] *Vide* P. Z. S. 1874, p. 119.
[3] Ibis, 1870, p. 179.

is but little different from that of the Capitonidæ. The palate of *Megalæma asiatica* is described and figured by Professor Parker in the 'Transactions of the Linnean Society'[1]. It is truncated in front and strongly bifid, the cornua running forward to blend with the maxillo-palatines. These last-named inward-directed processes of the maxillary bones blend with the mid-nasal septum in some

Fig. 1.



Palate of *Indicator*.

specimens of *Megalæma asiatica*, whilst in others they remain free from one another, separated by an inconsiderable interval. In *Pogonorhynchus bidentatus* and *Tetragonops ramphastinus* they completely blend across the middle line, without the nasal median septum persisting in front of the junction. So these two last-named species, and most probably all the species of the genera, are genuinely desmognathous.

The point in which the truncated vomer of the Capitonidæ most differs from that of the order Passeres, is that in the former the truncation occurs behind the line joining the posterior angles of the maxillo-palatines, whilst in the latter the truncation occurs some way in front of the same transverse line. The limbs of the forked vomer in the Capitonidæ run forward to meet the posterior angles of the maxillo-palatines; in the Passeres they continue, often in cartilage alone, to the nasal labyrinth.

[1] 2nd series, Zoology, vol. i. p. 122, and pl. 23.

In *Indicator* the vomer is less ossified than in the Capitonidæ above mentioned, and is smaller; the fork is slenderer and has longer limbs, which, however, quite typically join the well separated maxillo-palatines (which advance but slightly beyond the inner margins of the palatine bones) at their posterior angles.

As the Ramphastidæ have to be mentioned so frequently in connexion with the genus under consideration, it may be useful to refer to the vomer of this family. By Prof. Huxley it is included among his Coccygomorphæ, in which the vomer, if present, is pointed anteriorly. Prof. Huxley further remarks[1] that in *Ramphastos* "the antero-internal angles of the palatines not only meet, but are united by bone." But close examination demonstrates *a large tabular truncation* of the anterior extremity in the Ramphastine vomer, which I cannot help thinking Prof. Huxley interpreted as a median osseous bridge formed by the (supposed) blending of the antero-internal angles of the palatines. Figure 2 represents the vomer of

Fig. 2.



Palatal aspect of the truncated vomer of *Ramphastos ariel*, with the posterior parts of the palatine bones retained in union with it.

Ramphastos ariel, freed from its surroundings. It does not send forward limbs to join the maxillo-palatines [which are those of the desmognathous Capitonidæ inflated], but helps by its terminal expansion to complete, by contact or ankylosis with the palatine on either side, the posterior wall of a cavity in the dried skull, bounded laterally and superiorly by the inflated and infused maxillo-palatines, anteriorly by the nasal septum together with ossifications in the nasal cartilages associated with it.

In the 'Transactions' of the Linnean Society[2] Prof. Parker describes the vomer of *Ramphastos toco* as double, it being composed of a smaller posterior and a larger anterior bone, the truncated nature of which I am not able to infer from the account given.

The Capitonidæ, the Ramphastidæ, and *Indicator* are intimately associated, therefore, so far as the vomer is concerned. Nevertheless the proportionally great length of the limbs of the vomerine fork in the last-named form, and the considerable separation of its small

[1] P. Z. S. 1867, p. 444. [2] Linn. Trans. 2nd ser. vol. i. p. 127.

maxillo-palatines, are characters which tend to bring it nearer than either of the others to the Picidæ.

The pterygoid bones of *Indicator* are much flattened from above downwards, with thin outer and inner margins, which are curved, a triangular groove on the palatal surface running from end to end. In the Capitonidæ and Ramphastidæ these bones are much more cylindroid, the superior surface alone being thin-edged, whilst in the Picidæ they are thin, as in *Indicator*, but differ in possessing a large anteriorly directed process springing from the superior surface of each.

In *Indicator* there is a small notch in the middle of the superior margin of the osseous orbit, no trace of which exists in any of the other birds above referred to. In its external osseous nares, also, there is no tendency towards the Ramphastine position of those orifices, such as is so well marked in *Tetragonops*; the alinasal ossification that tends to divide each of the nares into an anterior and a posterior moiety is likewise far less considerable than in *Megalæma*.

As is known, and well illustrated in Mr. Sclater's figure of the bone (Ibis, 1870, p. 178), the sternum agrees most closely with that of the Capitonidæ and Ramphastidæ; and this is especially the case in the imperfect development of the posterior extremity of the median xiphoid process, which in the Picidæ continues further onward to reach the level of the ends of the lateral xiphoid processes, at the same time that the manubrial rostrum of the last-named family only of the group is bifid. As to the posterior sternal notches, the inner is the deeper; and the same is the case in *Gecinus viridis*, whilst in *Picus*, the Capitonidæ, and Ramphastidæ the outer is the deeper.

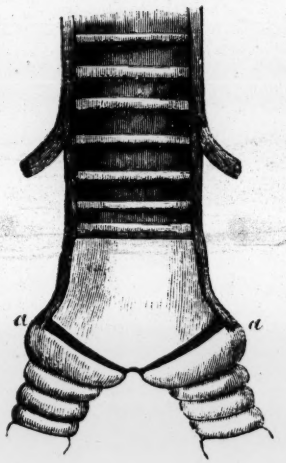
In its soft parts *Indicator* agrees with the Capitonidæ, Ramphastidæ, and Picidæ, and differs from the Cuculidæ, in the following particulars:—There is only one carotid artery, the left; the ambiens and the accessory femoro-caudal muscles are absent (the latter of these is wanting in the Tree-Cuckoos); there are no colic cæca. The femoro-caudal, semitendinosus and accessory semitendinosus are present, as is the large gluteus. The tensor patagii brevis muscle of the wing is inserted into the extensor metacarpi radialis longus exactly as in the Capitonidæ, Ramphastidæ, and Picidæ, and as in no other birds [1]. As in these three groups also (and in the Galbulidæ, but not in the scansorial Cuculidæ and Psittaci), the deep plantar tendons are distributed peculiarly—the flexor profundus digitorum supplying the third digit only, whilst the flexor longus hallucis sends slips to digits I. II. and IV., as well as a vinculum to its companion muscle [2]. The trachea at its lower end (fig. 3, p. 935) consolidates into a bony box, formed by the fusion of the lowermost rings. To the enlarged uppermost bronchial half-ring (*a a*) the single slender intrinsic muscle of each side fans out to be attached at its middle.

Summing up the results of the above analysis, it may be stated that, among the Piciform birds, pterylosis, osteology, myology, and visceral anatomy place the Picidæ, *Indicator*, the Capitonidæ, and

[1] *Vide* P. Z. S. 1876, p. 508, pl. xlviii. fig. 1.
[2] *Vide* P. Z. S. 1875, p. 346.

the Ramphastidæ in one great group of subordinal importance (if the peculiar hammer skull of the Picidæ be omitted from consideration). In this suborder the Picidæ constitute one main division—a family; whilst I, for one, cannot separate off the Capitonidæ from the Ramphastidæ by any well marked differences, the two subfamilies graduating into one another.

Fig. 3.



Syrinx of *Indicator major* (enlarged); anterior aspect.

Indicator must, in my opinion, also be placed in this family, from all members of which it differs in possessing an extra pair of rectrices. No one, however, objects to keeping all the Momotidæ together because of a similar difference in some of its genera; why remove *Indicator* therefore from its allies? Nevertheless *Indicator* is not exactly like a Capitonine bird in certain details, so may be placed as a subfamily by itself, the Indicatorinæ; and the whole series may be thus tabulated.

Order.	*Suborder.*	*Family.*	*Subfamily.*
Piciformes.	Pici.	Picidæ.	Indicatorinæ.
		Capitonidæ.	Capitoninæ.
			Ramphastinæ.

4. Contributions to the Ornithology of the Philippines.—No. XI. On the Collection made by Mr. A. H. Everett at Zamboanga, in the island of Mindanao. By Arthur, Marquis of Tweeddale, F.R.S., President of the Society.

[Received October 26, 1878.]

(Plates LVII.–LIX.)

The Spanish settlement of Zamboanga, situated at the southern extremity of the long south-western limb of the large Philippine island of Mindanao, is classical ground to the ornithologist. More than a century ago Sonnerat collected birds there; and in the year 1839 D'Urville's second Expedition remained a couple of months at Zamboanga. Yet only 19 species in all were recorded from Mindanao when in 1875 I published my List of Philippine Birds. Since that date Dr. Steere and the naturalists of the 'Challenger' Expedition have collected in the vicinity of Zamboanga, and added 40 species, thereby increasing the total of known species to 59.

Mr. Everett arrived at Zamboanga last March, and remained through April and part of May. During his stay he obtained examples of 98 species of birds. Mr. Everett writes that these were all procured "within a radius of ten miles of Zamboanga, chiefly in the hilly country some five miles distant at the back of the town." Of these 98 species only 33 had been previously known to inhabit this part of Mindanao; so that 65 species have been added by Mr. Everett, of which 11 are new to the Philippines, the following 6 being also new to science—

Pseudoptynx gurneyi,
Ninox spilocephalus,
Scops everetti,
Chætura picina,
Lyncornis mindanensis,
Volvocivora mindanensis,—

the remaining 5 having been previously unknown in the Philippines—

Accipiter stevensoni,
Ninox lugubris,
Coccystes coromandus,
Cacomantis sepulchralis,
Ptilopus melanocephalus.

Examples of 6 species previously said to have a Philippine habitat Mr. Everett found at Zamboanga, thus reducing the number of uncertain Philippine species to 29.

Twenty species authentically recorded from Zamboanga and its vicinity are not contained in Mr. Everett's collection; so that the now known total of Zamboanga species identified from specimens amounts to 118.

Mr. Everett writes:—"I enclose a note of the species observed by me here, which I think were not represented by skins in my col-



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J. Smit lith. Hanhart imp.

ACCIPITER STEVENSONI



J. Smit del. et lith. Hanhart imp.

PSEUDOPTYNX GURNEYI.



J. Smit, lith.

CHÆTURA PICINA.

lection. I have only included in these lists those birds the names of which I am absolutely certain I can give with accuracy."

Cacatua hæmaturopygia. [New to Zamboanga.]
Haliastur intermedius. [Already recorded.]
Merops bicolor. [Already recorded.]
Entomobia gularis. [Already recorded.]
Sauropatis chloris. [Already recorded.]
Artamus leucorhynchus. [Already recorded.]
Anthus, sp.? [?]
Carpophaga, sp.? [Probably *Ptilocolpa griseipectus*, and new to Zamboanga.]
Turtur dussumieri. [New to Zamboanga.]
Charadrius fulvus. Throat and belly jet-black. [Already recorded.]
Tringoides hypoleucus. [Already recorded.]
Sterna, sp. Bill chrome; crown of head black; wing delicate brownish-grey; underparts snowy white. Rather large. [Probably *Sterna bergii*, and already recorded.]

Three of the above species (omitting the *Anthus* as undeterminable) not having previously been recorded from Zamboanga, when added to the number of species represented by specimens, raise the total number of birds known from this part of Mindanao to 121.

1. Cacatua hæmaturopygia (1).

[Zamboanga.]
I include this species on Mr. Everett's authority.

2. Prioniturus discurus (2).

[Zamboanga, ♀ ♂, April.]

3. Tanygnathus luzonensis (3).

[Zamboanga, ♀, May.]

4. Cyclopsitta lunulata (4).

[Zamboanga, ♂ ♀, March, April, and May.]
Examples with lunated collars are marked female by Mr. Everett, those with blue collars as being males.

5. Loriculus hartlaubi (7).

[Zamboanga, ♂ ♀, April and May.]

6. Hypotriorchis severus (9).

[Zamboanga, ♂, April: iris dark brown; bill black; cere and orbital skin greenish yellow; legs bright yellow; claws black.]
In the plumage described by Mr. Sharpe (Cat. Accipitres, p. 397) as belonging to the young bird.

7. Microhierax erythrogenys (10).

[Zamboanga, ♂ ♀, April.]

8. Accipiter stevensoni. (Plate LVII.)

Accipiter stevensoni, Gurney, Ibis, 1863, p. 447, t. xi.

[Zamboanga. *a*. ♀, April: iris golden; bill black; legs greenish ochre. *b*. ♀, April: iris golden; orbital skin greenish-yellow; bill leaden, apex and cere blackish; legs greenish-yellow, but pale brown on the toes; claws dark brown. *c*. ♂, pullus, April: iris yellow; bill black; legs light green; sole of foot yellow; claws black. *d*. (sex ?), pullus, April: iris yellow; cere greenish; beak and claws black; legs light greenish; sole of foot yellow.]

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Middle toe. in.
a. ♀.....	7·50	5·75	1·87	1·16
b. ♀.....	6·75	5·75	1·75	1·25
c. ♂ juv. (♀?) .	5·75	4·00	1·81	1·25
d. ♂ juv.	5·12	4·00	1·62	1·06

Example *a* is slaty brown above, darkest on the head. Rectrices pale greyish slate-colour, with five dark-brown bands on middle pair. The under surface is white; the pectoral, abdominal, and flank-plumes being traversed with two, three, or more pale-brown bands. The pure white throat has a dark brown and extremely narrow median line formed by the white feathers having a very fine dark edging to the shafts. The quills underneath are regularly banded with white and brown, above brown banded with dark brown. The innermost tertiaries are at most pure white with a pale brown margin. Axillaries pure white with a series of narrow brown cross bars.

Example *b* (which is figured in the accompanying plate) has the breast and abdomen uniform pure bright rufous. When the feathers are discomposed they appear white banded with bright rufous. Vent and under tail-coverts are pure white. Thigh-coverts white, with faint pale rufous cross bands. Middle of throat white, with terminal pale earthy marks. Sides of head dingy pale rufous-brown. Upper plumage brown, mixed with rufous in some of the feathers. Middle pair of rectrices with six transverse brown bands. Quills barred as in example *a*, pale rufous occupying the interspaces between the brown bands to a great extent. Axillaries white, banded with pale rufous.

Examples *c* and *d* are of nestlings in rufous dress. Underneath creamy-fulvous, with broad ruddy brown stripes. A central gular stripe of brown. Middle pair of rectrices with three brown bands. Upper surface of body and head dark brown, with rusty margins and bases to the feathers. Thigh-coverts spotted with light ruddy brown.

Mr. Gurney observes on these specimens as follows:—The hawk "marked *a* on the ticket is a female of *Accipiter stevensoni* in the ordinary adult dress; that marked *b* I believe to be the same; but I have never before seen a *female* with so rufous a breast, though it much resembles the figure of the male type specimen (now somewhat faded) in the 'Ibis' (*l. s. c.*). The two nestlings may be either *A. ste-*

vensoni or *A. virgatus*. We have a very similar one from Java; but as both species are found there, I am not sure to which it belongs, but probably to *A. virgatus*, as I suspect that *A. stevensoni* is only a winter visitor to Java. Judging from the size of the tarsus and foot, I think the larger nestling, marked *c*, is a female though marked male, and that the smaller, marked *d*, is a male."

Having expressed to Mr. Gurney some doubts about the correctness of identifying example *b* with the female of *A. stevensoni*, that gentleman kindly favoured me with the following remarks:—

"Your rufous-breasted hawk from the Philippines, which I marked *b*, is certainly nearer to *A. stevensoni* than to any other species that I am acquainted with; but since returning it to you I have felt some doubt as to whether it will not prove to belong to a distinct and undescribed species.

"Your bird differs in having the wing shorter than any of our females, and larger than any of our males. Our three males have but four transverse bars on the tail. Of our four females three have five bars, and the fourth (an immature bird from Java) four, like the males, whereas your specimen *b* has six, as mentioned in your letter.

"None of our females have any rufous on the breast; and in all our males it is hardly more than a tinge of buff. Our type specimen (a male, figured in the 'Ibis' for 1863, pl. 11) is perhaps somewhat faded; but our Curator is confident that it was never so rufous as is represented in the 'Ibis' plate; and in this I believe he is right.

"Your bird is more like the male of *A. stevensoni* than it is to the female; but as your collector has marked it ♀, it probably is so.

"Specimens of *A. stevensoni* are scarce, and we hardly know the limits of variation to which it is liable; and on this account I should be glad if additional specimens like your skin *b* could be obtained, before venturing to publish it as a species distinct from *A. stevensoni*; but at the same time, if it should ultimately prove distinct, it would by no means surprise me.

"I ought to add that as *A. stevensoni* has not yet been met with when paired, we have no positive proof that the bird which I suppose to be its female (the type being a male) is so, though I do not myself entertain any doubt of such being the case."

9. Spilornis holospilus (16).

[Zamboanga, ♂ ♀, April and May.]

10. Elanus hypoleucus (18).

[Zamboanga, ♂ juv., May: iris light yellow-brown; bill black; cere greenish yellow; feet pale chrome; claws black.]

11. Ninox spilocephala, sp. n.

[Zamboanga, ♂, March: iris golden; bill greenish leaden; feet pale yellow. ♀, April: iris golden; bill-greenish lead, tinged yellow on culmen and tip; feet wax-yellow. ♀, April: iris light greenish-yellow.]

Were it not that the large series of examples sent by Mr. Everett (six males and thirteen females) all agree in having spotted heads, I should not have ventured to separate the Zamboanga species from *N. philippinensis* of Luzon. Every variety of markings and colorations is exhibited in this series, from dark brown to tawny-rufous brown above, and stripes and spots of the same colours below; but all the nineteen examples have the frontal and coronal feathers brown, spotted with rufous—in some bright rufous, in others pale tawny rufous. Some have the whole under plumage, from throat to vent, dark-centred; others have the breast almost uniform rich rufous, without pale margins, and with a subterminal brown transverse narrow band.

Every specimen has its sex noted on its label; and the length of the wing in the six birds marked ♂ is greater than in those marked ♀. The wing of the six males ranges in length from 6·50 to 7·0, of the thirteen females from 6·25 to 6·50. Two Luzon males have the wings 6·37 and 5·25. Mr. Sharpe (Cat. ii. p. 168) states 2 inches as the length of the tarsus of an example of *N. philippinensis* in the British Museum; none of these Zamboanga birds has the tarsus longer than 1·12.

12. NINOX LUGUBRIS.

Strix lugubris, Tickell, J. A. S. B. ii. p. 573.

[Zamboanga. *a*. ♀, March: iris golden; bill blackish; cere, culmen, and mandible greenish yellow; feet dark chrome-yellow; claws black. *b*. ♀, April: iris deep brown; bill greenish; feet chrome-yellow.]

Dimensions:—

	Wing. in.	Tarsus. in.	Culmen. in.	Tail. in.
a	8·30	1·12	0·62	4·75
b	8·14	1·12	imperfect.	4·82

Six caudal bands. First two primaries without bars. The wings of a ruddy hue. The outer webs of most of the primaries rusty-red.

The remarks Mr. Gurney has been good enough to favour me with about this Zamboanga race of *Ninox lugubris* are as follows:—"I think the outer webs of the primaries unusually rufous. We have only one similar specimen, which is from Formosa and is described in Sharpe's volume (Catalogue, ii. p. 161); and with this specimen the Zamboanga bird seems to me to agree generally. If *N. japonica* be admitted as distinct from *N. lugubris* (though I doubt whether it ought to be), the Zamboanga specimen, I think, ought to be referred to *N. japonica*."

Mr. Sharpe has suggested (*t. c.* p. 166) that the large Japanese and North-China form is migratory. These Zamboanga examples favour his hypothesis.

13. PSEUDOPTYNX GURNEYI, sp. n. (Plate LVIII.)

[Zamboanga, ♂, pairing, April: iris warm brown; bill greyish white; feet pale grey; claws white tipped with dark grey.]

Sides of face bright pure unmarked rufous. Lengthened stiff plumes springing from base of maxilla rufous mixed with tawny, and many with dark-brown shafts and tipped with dark brown. Space above front of eyes, uniting on forehead and extending back over the eyes, pale tawny rufous. Crown and occiput dark rufous, many of the feathers with a dark brown broad mesial stripe. Nape and sides of neck pure rufous. Lengthened ear-tufts the same, some with very narrow brown mesial linear markings near their apices. Plumes bordering the facial disk albescent tawny; some almost pure white, tipped with dark brown. Chin and upper throat pale tawny rufous. Middle of throat white. Breast and remainder of lower surface pure rufous, more dilute on lengthened tibial plumes and under tail-coverts. A few pectoral plumes, with dark-brown large terminal drops. Many abdominal plumes, with dark-brown elongated central stripes. Back rufous, minutely freckled with brown, each feather with a bold, irregular, dark-brown central stripe. Scapulars like the back, but some of the shorter and outer albescent tawny on outer webs. The dark brown central marks are so arranged that the back, together with the scapulars, appears to have three parallel dark-brown stripes running down it. Uropygium and upper tail-coverts rufous-brown, with darker shafts. Rectrices brown, minutely freckled with pale rufous, and with eight or nine narrow pale rufous cross bands. Minor and median wing-coverts brown, freckled with rufous, and each with a dark narrow central brown line. Major coverts brown on inner web, freckled with rufous on outer. Quills brown, alternately banded with freckled brown and pale rufous. Tertiaries pure rufous, with traces of dark brown along the shafts. Carpal edge white; wing-lining yellowish white; some of the under carpal coverts rufous. Thigh and tarsal coverts pale rufous and tawny white.

Mr. J. H. Gurney writes to me:— "The *Pseudoptynx* is certainly distinct from *P. philippinensis*, and, so far as I know, is undescribed. Besides its very much smaller size, it is very much more rufous below, and of a much darker rufous above; and the dark central marks of the mantle are altogether of a different character, and very much less coarse than those in *P. philippinensis*. As to the difference of size, we have two specimens of *P. philippinensis* here; and the comparison between their dimensions and those of the Zamboanga bird is as follows:—

	Wing.	Tarsus.	Middle toe.	Culmen without cere.
	in.	in.	in.	in.
"*P. philippinensis*, No. 1..	15·5	2·4	1·6	1·4
,, ,, No. 2..	imperfect	2·5	1.5	1·5
"*P. gurneyi*	9·3	1·8	1·4	1·1."

The dimensions of the type in the British Museum given by Mr. Sharpe (Cat. ii. p. 43) also much exceed those of the Zamboanga bird.

I name this fine Owl after Mr. Gurney, to whom for many years

I have been largely indebted for great assistance in determining the obscurer species of Rapaces.

14. Scops everetti, sp. n.

[Zamboanga, ♀, April: iris warm brown; bill pale greenish leaden, nearly white; feet whitish grey; claws dark grey. ♂, April: iris deep brown; feet whitish.]

Mr. Everett has sent three examples of a species of *Scops*, which may be described as being a large form of *Scops lempiji* as it occurs in Java. Above it has the deep rich brown colouring of the Javan species; the same broad dark-brown mark in the form of a parallelogram on the head and nape; the same pale-coloured forehead, stripe above each eye and round the nape, and the broad dark brown stripe leading from behind the eye, and including most of the ear-tufts. In the Zamboanga species (as represented in Mr. Everett's series) there are no pale uniform tawny or fulvous scapulars. Underneath, the markings differ from those of the Javan bird by being more confused, and by the absence of regular dark-brown cross markings on the abdominal plumes. The general colouring of the under surface is of a ruddier brown.

Dimensions:—

	Wing. in.	Tarsus. in.	Tail. in.	Culmen. in.
♂....	6·50	1·20	3·50	0·62
♀....	6·75	1·20	3·62	0·68

Mr. Sharpe, to whom I submitted two of the specimens, has obliged me with the following observations:—"Your Owl is of the *S. lempiji* group, having that peculiar light streak on the sides of the crown, running onto the ear-tufts; but underneath it is quite aberrant, and verges more towards the Moluccan *S. leucospilus* section. At the same time I expect it will come very near *Scops umbratilis*, Swinhoe."

Mr. Gurney writes, "The Owl is new to me, and different to any that we have here."

15. Thriponax javensis (28).

[Zamboanga. ♂, March: iris yellow.]

The white at the tips of the primaries is unusually developed in the specimens from Zamboanga.

16. Chrysocolaptes lucidus (32).

Chrysocolaptes maculiceps, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 314, t. xlvi. fig. 2.

[Zamboanga, ♀, May: iris crimson.]

An example (marked a female) wears the plumage of *C. maculiceps*, as described and figured by Mr. Sharpe.

17. YUNGIPICUS VALIDIROSTRIS (33 *partim*).

Picus nanus, Vigors, Blyth, J. A. S. B. 1845, p. 197.

Picus validirostris, Blyth, Cat. Calc. Mus. p. 64. no. 305; J. A. S. B. 1849, p. 805.

[Zamboanga, ♂ ♀, May: iris crimson?; bill black; mandible lead-grey; feet olive.]

When writing on *Picus maculatus*, Scopoli (Tr. Z. S. ix. p. 148), I stated that the titles I then brought together were treated as synonyms on the assumption that the islands of Luzon, Panay, and Mindanao possessed but one and the same species of *Yungipicus*. I had had no opportunity of examining an example from any one of the Philippine Islands. Since then Mr. Everett has sent me examples of a species of the genus from Luzon; and these I identified (P. Z. S. 1877, p. 689) with *P. maculatus*, rather than create a new title, while their dimensions were too small for *P. validirostris*, Blyth. The birds from Zamboanga differ specifically from the Luzon species. They are larger; the uropygium and upper tail-coverts are unspotted tawny-white; and the rectrices are tawny buff banded with dark brown, and not dark brown, for the most part, as in the Luzon bird, with narrrow albescent bands or marks. In both, the lower throat and upper breast are spotted, and not streaked, as in *Y. fuscoalbidus* of the Sunda Islands and Malacca. Until typical examples of *P. maculatus* from Panay are compared, it cannot be affirmed whether the type of *P. maculatus* belongs to the Luzon or the Mindanao species, or whether it may not be a species distinct from either. In the meantime I adopt Blyth's title, the dimensions he gives being exactly those of the Zamboanga species:—bill to forehead 0·75; wing 3·25.

I may mention that *Y. aurantiiventris*, Salvadori, is an excellent species, quite distinct from *Y. fuscoalbidus*.

18. HARPACTES ARDENS (34).

[Zamboanga, ♀, March: coloration of soft parts as in male.]

The coloration of the soft parts is not mentioned on the labels of the males sent.

19. ALCEDO BENGALENSIS (38).

[Zamboanga, ♀, March.]

20. PELARGOPSIS GIGANTEA.

Pelargopsis gigantea, Walden, Ann. & Mag. Nat. Hist. ser. 4, xiii. p. 123.

[Zamboanga, ♂ ♀, March and May.]

21. CEYX ARGENTATA.

Ceyx argentata, Tweeddale, *anteà*, p. 108. no. 7, t. vi.

[Zamboanga, ♂, May.]

22. ENTOMOBIA GULARIS (44).

[Zamboanga.]

23. Halcyon winchelli.

Halcyon winchelli, Sharpe, Tr. L. S. (2) Zool. i. p. 318, t. xlvii.

[Zamboanga, ♀, April: iris dark brown; bill black; the basal half of mandible white; feet light greyish-green.]

I have not been able to compare the Zamboanga birds with the Basilau type; but the female agrees well with Mr. Sharpe's description and plate. A second example (sex unrecorded) differs in having the whole under surface pure white.

24. Calialcyon coromanda (46).

[Zamboanga, ♀, March.]

The discovery of this species by Mr. Everett at Zamboanga removes all doubts of its being an inhabitant of the Philippines.

25. Actenoides hombroni (48).

[Zamboanga, ♂, April: iris brown; bill orange-red; the culmen blackish; feet dirty greenish orange.]

In the perfectly adult male the crescentic pectoral markings disappear.

26. Xantholæma hæmacephala (50).

[Zamboanga, ♂, March and April.]

27. Macropteryx comatus (52).

[Zamboanga, ♂, April.]

28. Chætura picina, sp. n. (Plate LIX.)

[Zamboanga, ♀, April.]

Black with a blue gloss, greenish in some lights. Chin, throat, and larger under wing-coverts pure white. Wing 6·37; tail 1·25.

29. Lyncornis mindanensis, sp. n.

[Zamboanga, ♂, April: iris warm brown; feet purplish brown.]

Typical *L. macrotis* (ex Luzon) has the crown, forehead, ear-tufts, and nape rufous brown, of almost the same shade as in *L. temminckii*. The three examples of the species of *Lyncornis* which inhabits the vicinity of Zamboanga, sent by Mr. Everett, differ from *L. macrotis* by having the crown, nape, forehead, and ear-tufts dark greyish-brown, and not rufous, by all the browns of the plumage being much darker, and by the wing being shorter. Wing 9·90.

30. Caprimulgus manillensis (55).

[Zamboanga, ♀, April.]

Compared by Mr. Sharpe with the type.

31. Batrachostomus septimus.

[*Batrachostomus septimus*, Tweeddale, P. Z. S. 1877, p. 542, no. 13.

[Zamboanga, ♂, April: iris orange-yellow; bill light horn-

brown; feet pale ochreous yellow; nails grey. Interior of gape, ♂ ♀, lemon-yellow.]

Two examples of the adult male and one of an adult female are sent by Mr. Everett. The white nuchal band of the female is not so conspicuous as in the type, nor are the white markings of the throat-band and pectoral plumes. The general hue of the male-plumage agrees with that of the female; but in the males the elongated scapulars have the outer webs pure white, with a black subterminal spot on the inner web. Four examples of this species are now known, two of males and two of females; and all four are in the rufous phase. Mr. Everett, in his remarks about one of the males is very explicit; he writes:—"I have one *Batrachostomus*, a good skin; it is in rufous plumage, and is ♂. I took especial care in the sexing; and luckily the parts had not been touched by shot. Judging from the size of the testes, I think the bird is rather immature."

32. CACOMANTIS SEPULCHRALIS ?

Cuculus sepulchralis, S. Müller, Land- en Volkenk. p. 177.

[Zamboanga, ♂ ♀, April.]

Mr. Everett obtained five examples of a Plaintive Cuckoo, two of which are in adult plumage, and so closely resemble the Javan *C. sepulchralis*, that I do not venture to separate them. The dimensions of the wings and tail are slightly less, while the chin and throat are of the same rufous as the breast, and not grey. S. Müller described (*l. c.*) the chin of the Javan and Sumatran type as being grey; and so it is in my Javan specimens; but it is not certain that in Javan birds this grey does not change into rufous. An example obtained by Mr. Everett at San Mateo, Luzon (*C. merulinus, a*, P. Z. S. 1877, p. 691. n. 19), belongs, without doubt, to *C. sepulchralis*, and has the chin and upper throat grey, the others being examples of true *C. merulinus*. This last species can hardly be kept separate from the grey-breasted species of Continental Asia, *C. threnodes*, &c.

33. SURNICULUS VELUTINUS.

Surniculus velutinus, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 320.

[Zamboanga, ♀, April.]

34. CHALCOCOCCYX MALAYANUS.

Cuculus malayanus, Raffles, Tr. L. S. xiii. p. 286, "Malay Peninsula" (March 1821).

? *Cuculus basalis*, Horsfield, Tr. L. S. xiii. p. 179, "Java" (April 1820).

[Zamboanga. *a.* ♂, April: iris burnt-sienna colour; orbital ring fine vermilion; bill blackish; feet very dark lead-grey. *b.* April: iris light yellowish brown; bill black; legs lead-grey; nails black.]

Mr. Everett sends three Golden Cuckoos, which, although somewhat smaller than typical examples, differ in no other respect.

Wing 3·62. I adopt the more recent specific title of *malayanus*, as it has not as yet been absolutely demonstrated that the Malayan-Peninsula bird is the same as the Javan. The only Javan example I have seen is pure white underneath, without any transverse bands. Above, the whole back is very dark green without any coppery gloss, the head and nape coppery greenish-brown. This individual is fairly represented on plate 102. f. 2, of the 'Planches Coloriées,' under the title of *Cuculus chalcites*, Illiger, exact habitat unknown. It may be only a phase of plumage; but Horsfield and Moore (Cat. Mus. E. I.C. ii. pp. 706, 707) keep the Malaccan species distinct from the Javan.

35. HIEROCOCCYX PECTORALIS (60).

[Zamboanga, ♂, April: iris pale yellow; orbital skin bright chrome-yellow; bill black; mandible and base of maxilla greenish; feet bright wax-yellow; claws horn-yellow.]

A single example, which agrees in every detail with the description given by Dr. Cabanis. It may also belong, as suggested by me (*l. c.*), to *Cuculus hyperythrus*, Gould; but it differs from the figure of that species in wanting the black chin, in not being so intensely rufous underneath, in the rufous colouring not extending below the breast, and in the upper plumage not being of so dark a shade of grey. It also has four, distinct, transverse, narrow, dark caudal bands, and not merely two as described by Mr. Gould.

36. COCCYSTES COROMANDUS.

Cuculus coromandus, Linn. S. N. i. p. 171. no. 20.

[Zamboanga, ♀, March: iris brown; bill jet-black; feet bluish grey; interior of gape salmon-red.]

New to the Philippines, and a most unexpected addition to their fauna.

37. EUDYNAMIS MINDANENSIS (61).

[Zamboanga, ♀, March: iris bright crimson; bill and legs greenish plumbeous. *b*, ♂, March.]

These are typical examples of the species, and do not differ from North-Mindanao examples. They are somewhat smaller than birds from Guimaras and Zebu. Maximum length of wing 7·50. In the female the spots and bands appear in this species to be always rufous.

38. CENTROCOCCYX VIRIDIS (64).

[Zamboanga, March.]

39. PYRRHOCENTOR MELANOPS (65).

[Zamboanga, ♂ ♀, March.]

Sexes alike.

40. BUCEROS MINDANENSIS.

Buceros mindanensis, Tweeddale, P. Z. S. 1871, p. 543.

[Zamboanga, ♂ ♀ ♀ juv., March.]

41. PENELOPIDES AFFINIS.

Penelopides affinis, Tweeddale, P. Z. S. 1877, p. 824. n. 29. f. 1.

[Zamboanga, ♂ ♀, March.]

A new outer rectrix has the central band pure white, the central bands on all the other rectrices being bright rufous.

42. LANIUS NASUTUS (70).

[Zamboanga, ♂ ♀, April.]

Mr. Everett sends a nestling killed in April.

43. LANIUS LUCIONENSIS (72).

[Zamboanga, ♂, April.]

44. GRAUCALUS STRIATUS (73).

[Zamboanga, ♂, April: iris pale yellow.]

Two examples marked ♂ have uniform plumbeous breasts and banded underparts and uropygium. One marked ♀ is banded from the chin downwards as well as on the uropygium.

45. VOLVOCIVORA MINDANENSIS, sp. n.

[Zamboanga. *a*. ♂, April: iris dark brown; bill and legs black. *b*. ♀, April: iris dark brown. *c*. ♀, April: iris dark chocolate-brown.]

Adult male (*a*). Chin, cheeks, sides of head, space before the eyes, a broad supercilium, ear-coverts, forehead, throat, and upper breast jet-black. Remainder of breast, crown, and whole under surface of body dark leaden-grey, paler near the vent and on the under tail-coverts. Wing-coverts, nape, and axillaries a slightly lighter shade of leaden-grey, palest on the uropygium and upper tail-coverts, which are slightly mixed with white. Quills above black, with faint grey margins. Sixth and remaining primaries tipped with greyish white. Secondaries and tertiaries leaden-grey on their outer webs. Part of inner webs of quills, seen from underneath, pale grey. This colour commences at the base of the first primary, occupying but a small part of it, but is more extended on each succeeding quill, and reaches to the extremities of the inner quills. Rectrices jet-black; outer pair with a large grey terminal mark, the same colour being slightly indicated on the next pair. Carpal edge and wing-lining almost black.

Adult female (*b*). The same as the male, but the grey colour of the whole plumage of a paler shade, the uropygium more albescent, and no black about the head, throat, and breast. Carpal edge and axillaries pale grey.

Young female (*c*). Like the adult, but the grey colour not so pure. The chin, central part of the throat, a few scattered feathers on the breast and flanks, the wing-lining, and axillaries finely banded with white. Upper tail-coverts nearly pure white. Outer margins of some of the secondaries and carpal edge inclining to white.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂ ad.	4·62	4·0	0·88	0·88
♀ ad.	4·50	4·0	0·88	0·88
♀ juv.....	4·48	3·88	0·88	0·87

A representative form of *V. morio* ex Celebes, but altogether of a darker shade of grey, with a black forehead, and with the inner margins of the quills grey, and not pure white.

46. Lalage dominica (76).

[Zamboanga, ♀, April.]

47. Dicrurus striatus.

Dicrurus striatus, Tweeddale, P. Z. S. 1877, p. 545. no. 20.

[Zamboanga, ♀, March : iris crimson.]

48. Leucocerca nigritorquis (83).

[Zamboanga, ♀, April.]

49. Cyornis philippinensis (84 *partim*).

Cyornis philippinensis, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 325.

[Zamboanga, ♀, March.]

50. Hypothymis azurea (85).

[Zamboanga, ♀, May: maxilla black, mandible light blue; legs dark grey slate ; interior of gape yellow.]

51. Broderipus acrorhynchus (90).

[Zamboanga.]

52. Erythropitta erythrogastra (94).

[Zamboanga, ♂ ♀, March, April, May.]

These examples all belong to *E. erythrogastra*, and not to the Balabac race named *B. propinquus* by Mr. Sharpe (Tr. L. S. (2) Zool. i. p. 330). The young Dumalon (Mindanao) example obtained by Dr. Steere, and doubtfully identified with *B. propinquus* by Mr. Sharpe (*l. c.*), in all probability belongs to *E. erythrogastra*.

An immature bird, killed in April near Zamboanga, is dirty rufous brown above, with dashes of green; rectrices blue; wing-feathers without a trace of blue; under surface dirty white, feathers margined with pale rufous brown ; some scarlet feathers on the breast; vent and under tail-coverts washed with brownish red. The females differ in the scarlet colouring of the abdominal region not being so intense and vivid, and in the throat not being so dark brown, almost black. The blue colouring of the breast is not exhibited until complete maturity, that part remaining green. In fully mature birds of both sexes the green pectoral band is almost entirely replaced by blue.

53. Melanopitta sordida (95).

[Zamboanga, ♂, March: iris chocolate; bill black; legs brownish grey. ♂ ♀, March, April, and May.]

This species has the black central abdominal patch much more largely developed than in *M. muelleri* ex Borneo. In no other respect does it appear to differ. The extent of pure white on the quills is dependent on sex. Of fourteen individuals with the sex noted by Mr. Everett, nine are males and five are females. The primaries of the male have a much greater white surface than is found in the primaries of the female. The 6th, 7th, and 8th primaries are scarcely tipped with black; and the first five primaries have double the amount of white that exists on the primaries of the female. On examining Luzon and Negros examples with the sexes noted by Dr. B. Meyer, the same character differentiates the sexes. In Bornean individuals of *M. muelleri* (sex determined by Mr. Everett) the sexes can be discriminated by the amount of white on the remiges. In *M. cucullata* some of my examples exhibit a maximum of white on the quills and the others a minimum; but as none have had their sexes determined by dissection, I am unable to affirm that in that species the same law holds good. In two Zamboanga skins the green of the breast and flanks is assuming the blue tint so prominent in the large representative form *M. steerii*.

54. Melanopitta steerii.

Brachyurus steerii, Sharpe, 'Nature,' August 1876, Tr. L. S. ser. 2, Zool. i. p. 329, t. xlix.

[Zamboanga, ♂, March and April.]

55. Macronus striaticeps.

Macronus striaticeps, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 331.

[Zamboanga, ♂, March: iris white: bill black; legs purplish grey.]

56. Ixus goiavier (99).

[Zamboanga, ♂ ♀, March.]

57. Poliolophus urostictus (101).

[Zamboanga, ♂, April: orbital ring light yellow.]

58. Hypsipetes rufigularis.

Hypsipetes rufigularis, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 335.

[Zamboanga, ♀, April; iris crimson; bill blackish brown; legs brown.]

59. Monticola solitarius (103).

[Zamboanga, ♀, April.]

60. Copsychus mindanensis (106).

[Zamboanga, ♂, March.]

61. PHYLLOSCOPUS BOREALIS.

Phyllopneuste borealis, Blasius, Naumannia, 1858, p. 313.

[Zamboanga, ♂ ♀, April.]

62. ORTHOTOMUS CINEREICEPS?

Orthotomus cinereiceps, Sharpe, Ibis, 1877, p. 113, t. ii. f. 2, "Basilan."

[Zamboanga, ♂, March: iris clay-orange; ♀, April.]

Mr. Sharpe's title is here adopted with doubt for this Zamboanga species of Tailor-bird, because it does not quite agree with the description and figure, and I have not been able to compare it with the type (now in America).

In the example marked as being of a male, the cheeks, chin, and entire throat are jet-black. In that of the female the chin and upper part of the throat are white, the middle of the breast, the abdomen, and vent are silky white, whereas in the male these parts are bright olive-green. The rectrices of the male are devoid of a subterminal bar; but in those of the female brown subterminal bars are conspicuous. It is not improbable that the male example with entire throat black is *O. cinereiceps* in full breeding-dress.

63. ORTHOTOMUS FRONTALIS.

Orthotomus frontalis, Sharpe, Ibis, 1877, p. 112, t. ii. f. 1, "Zamboanga."

[Zamboanga, ♂ ♀, March and April.]

The examples noted as belonging to males have no subterminal bar on the rectrices. Those marked as being of females have the subterminal bar well pronounced.

64. BUDYTES VIRIDIS (114).

[Zamboanga, ♂, April.]

65. ZOSTEROPS EVERETTI.

Zosterops everetti, Tweeddale, P. Z. S. 1877, p. 762. no. 42.

[Zamboanga, ♂ ♀, April.]

66. DICÆUM CINEREIGULARE.

Dicæum cinereigulare, Tweeddale, P. Z. S. 1877, p. 829. no. 50, "N. Mindanao."

[Zamboanga, ♀, April: iris dark brown; bill black; legs very dark grey, nearly black.]

The female differs from the male in wanting the orange-red interscapular patch, in the abdomen, vent, and under tail-coverts being pure yellow, and in the upper plumage being deeply tinged with olive-green.

67. DICÆUM RUBRIVENTRE (120 partim).

Pipra papuensis, Gm. S. N. i. p. 1004.

[Zamboanga, ♀, April: iris dark blood-red; bill and legs black.]

68. NECTAROPHILA JULIÆ.

Nectarophila juliæ, Tweeddale, P. Z. S. 1877, p. 547. no. 32, "Melanipa."

Cinnyris juliæ (Tweeddale), Shelley, *Cinnyridæ*, pts. vii. & viii.

[Zamboanga, ♂ ♀, April: iris brown; bill and feet black.]

In some examples of the male the breast is suffused with orange-red; in others little or no red is perceptible.

69. CYRTOSTOMUS JUGULARIS (123).

[Zamboanga, ♂ ♀, March and April.]

70. ANTHOTHREPTUS CHLOROGASTER.

Anthreptes chlorigaster, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 342; Shelley, *Cinnyridæ*, pt. vi. pt. vii. t.

[Zamboanga, ♀, April: iris indian-red; bill light umber-brown; legs greenish leaden.]

71. RHABDORNIS MYSTACALIS (124).

[Zamboanga, ♂, April.]

A single example, which differs from the Luzon species in its much shorter bill. Culmen barely 0·62, in the Luzon bird fully 0·75. The wing is also shorter; and the colouring of the wings and back is warm brown, and not greyish olive-brown.

72. CORVUS PHILIPPINUS (125).

[Zamboanga, ♂, March.]

73. CALORNIS PANAYENSIS (128).

[Zamboanga, ♂, March.]

74. SARCOPS CALVUS (129).

[Zamboanga, ♀, March.]

75. MUNIA JAGORI (132).

[Zamboanga, ♂ ♀, March.]

76. OSMOTRERON VERNANS (135).

[Zamboanga, ♂ ♀, March, April, May.]

77. PTILOPUS MELANOCEPHALUS.

Columba melanocephala, Forster, Zoologia Indica, p. 16. no. 7, t. viii., ex Java (1781).

[Zamboanga. *a*. ♂, March: iris, orbital skin, and bill yellow, with more or less of a green tinge; feet carmine, nails dark grey. *b*. ♂, April: iris yellow; bill yellow-green.]

Hardly separable from the Javan species. Wing 4·50. The tint of the throat-patch resembles that of *P. xanthorrhous*; but the abdomen and crissum are yellow, and not orange. New to the Philippines.

78. RAMPHICULUS OCCIPITALIS (138).

[Zamboanga, ♀ (juv.), March: iris dark brown; bill light brown, the basal half dull red; feet coral-red.]

Sexes alike.

79. PHABOTRERON BREVIROSTRIS.

Phabotreron brevirostris, Tweeddale, P. Z. S. 1877, p. 549. no. 38.

[Zamboanga, ♂ ♀, March and April.]

The pale, and not rufous, chin and throat distinguishes this species from *P. leucotis*.

80. CARPOPHAGA ÆNEA (141).

[Zamboanga, ♀, March.]

81. PTILOCOLPA GRISEIPECTUS (142)?

Mr. Everett remarks *in epist.*:—"The *Carpophaga* of the Zamboanga list is a bird markedly smaller than *C. ænea*; and those parts which in the latter are coloured fine bronzy green, are in the smaller species dark iron-grey." The above-given description, so far as it goes, agrees with *Ptilocolpa griseipectus*, a rare species in museums, and the exact habitat of which in the Philippines remains to this day (unless this identification is correct) undetermined.

82. MYRISTICIVORA BICOLOR (143).

[Zamboanga, ♀, May.]

83. HEMIPHAGA POLIOCEPHALA (144).

[Zamboanga, ♀ (not quite adult): bill black; orbital skin crimson.]

Sexes alike. The margin of the inner web of the first primary is scooped out, and that of the second a little less so.

84. MACROPYGIA EURYCERCA.

Macropygia eurycerca, Tweeddale, *anteà*, p. 288. no. 49.

[Zamboanga, ♂ ♀, March and April.]

Considerably smaller than the Negros type, but otherwise undistinguishable. Wing 6·75, as against 7·50; tail 7·00, against 8·00.

85. TURTUR DUSSUMIERI (147).

[Zamboanga.]

Included on the authority of Mr. Everett.

86. PHLOGŒNAS CRINIGERA.

Phlogœnas crinigera (Pucheran), Tweeddale, P. Z. S. 1877, p. 833. no. 66.

[Zamboanga, ♂ ♀, March and April.]

Sexes alike. An example marked "♂ juv." by Mr. Everett has the claret-coloured pectoral plastron only indicated by a few red

plumes, and the terminal margin of the major coverts fulvous instead of pale grey, the remainder of the plumage being marked and coloured as in the adult.

87. CHALCOPHAPS INDICA (150).

[Zamboanga, ♂ ♀, March.]

88. GALLUS BANKIVA (153).

[Zamboanga, ♂ ♀, March.]

89. MEGAPODIUS DILLWYNI.

Megapodius dillwyni, Tweeddale, P. Z. S. 1877, p. 766.

[Zamboanga, ♀, March: iris burnt sienna-brown; bill horn-brown; orbital skin dirty crimson; legs reddish-brown; tarsi[1] dark brown. ♂, March: orbital skin dark purplish brown.]

90. GALLINULA CHLOROPUS (169).

[Zamboanga, ♀, May: iris light warm brown; bill greenish yellow; frontal plate orange-red; legs grass-green.]

91. GALLICREX CINEREA (170).

[Zamboanga, ♂, March and April.]

92. ERYTHRA PHŒNICURA (171).

[Zamboanga, ♀, March.]

93. ORTYGOMETRA CINEREA (172).

[Zamboanga, ♂, April.]

94. PORZANA FUSCA (174).

[Zamboanga, ♂, April: iris brick-red; legs dull wax-red.]

95. GALLINAGO MEGALA (188).

[Zamboanga, ♀, March.]

96. RHYNCHÆA CAPENSIS (189).

[Zamboanga, ♂, May.]

97. ARDETTA CINNAMOMEA (192).

[Zamboanga, ♀, March.]

98. HERODIAS INTERMEDIA (196).

[Zamboanga, ♂, March.]

99. MELANOPELARGUS EPISCOPUS.

Ardea episcopus, Bodd. Tabl. d. Pl. En. p. 54.

[Zamboanga, ♀, March.]
In full dress.

[1] So written on label; perhaps a slip of the pen for the word "toes" or claws."

100. DENDROCYGNA VAGANS (203).

[Zamboanga, ♀, April.]

101. DYSPORUS SULA (214).

[Zamboanga, ♀, May: iris white; bill dirty white; orbital and gular space pale green; feet very light greenish yellow; nails grey.]

A young female in dirty-brown plumage, darkest on breast, throat, neck, head, and back.

5. Supplementary Note on the Neotropical Squirrels. By EDWARD R. ALSTON, F.L.S., F.Z.S., &c.

[Received November 8, 1878.]

I regret to say that several errors have crept into my paper "On the Squirrels of the Neotropical Region,"[1] owing in part to my absence from town when the sheets were passing through the press. Two or three of these appear sufficiently serious to require correction.

SCIURUS VARIABILIS. In the remarks on this species *S. rufo-niger* is a clerical error for *S. brunneo-niger*, at p. 666, seventh line, and at p. 667, second line.

SCIURUS PUSILLUS. At p. 670 I remark that I was not able to ascertain Geoffroy's type in the Paris Museum. It appears that I had overlooked it; for Professor A. Milne-Edwards has kindly informed me that it is still there. Unfortunately the skull is wanting, so that its age cannot well be ascertained. The want, however, is supplied by the British-Museum specimens, of which the skulls and teeth show them to be *fully adult*, although an unhappy misprint (p. 671, eighteenth line) makes me state the exact contrary. M. Milne-Edwards has sent me the following measurements of the types of *S. pusillus* and *S. rufo-niger*:—

S. pusillus.

	millim.	inches.
Length of head	0·039	1·56
,, head and body	0·089	3·56
,, tail	(imperfect)	

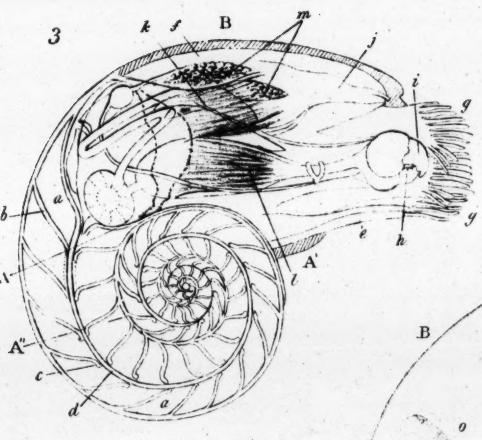
S. rufo-niger.

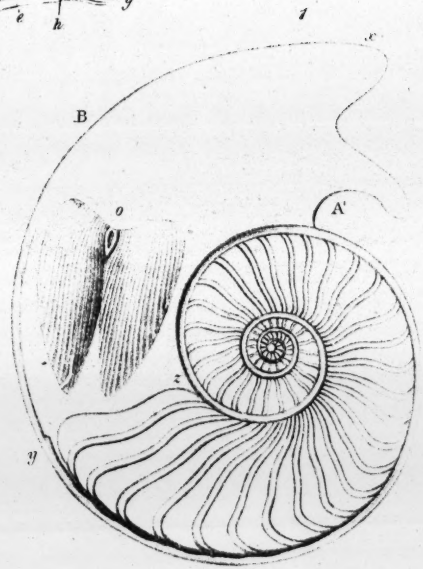
	millim.	inches.
Length of head	0·048	1·92
,, head and body	0·178	7·12
,, tail (with hair)	0·139	5·56

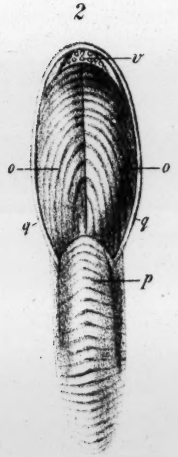
This last specimen appears to me to have been considerably overstretched in mounting.

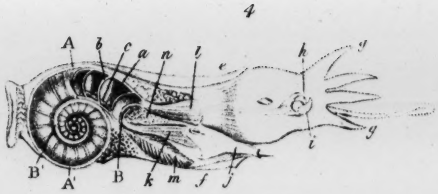
In conclusion I may add that I have had the pleasure of receiving a letter from Mr. J. A. Allen, in which he accepts almost all the determinations at which I arrived in the paper in question.

[1] *Suprà*, pp. 656–670.









R.O. del. J.Smit. lith.

Hanhart. imp.

CHAMBERED SHELLS OF CEPHALOPODS.

6. On the Relative Positions to their Constructors of the Chambered Shells of Cephalopods. By Prof. Owen, C.B., F.R.S., F.Z.S., &c.

[Received October 4, 1878.]

(Plate LX.)

The relations of the chambered and siphonated shells to their constructors can now, owing to the extent to which they have been subject to extinction, only be fully elucidated by a study of species or varieties of two of the genera, *Nautilus* and *Spirula*.

The fossil shells of Cephalopods, as is well known, exhibit a progressive uncoiling from *Nautilus* to *Orthoceras* and from *Ammonites* to *Baculites*, with various modifications of the process; but that this had been carried out to a coiling in the reverse direction, required anatomical evidence for its demonstration.

The insight, however, gained into the organization of *Spirula peronii* at the date of the publication of the 'Zoology of the Voyage of the Samarang'[1], added to that previously obtained on the organization of *Nautilus pompilius*[2], led me to express a conviction of their shell-relations in the following terms:— "These shells (*Nautilus* and *Ammonites*) are revolutely spiral or coiled over the back of the animal, not involute like the Spirula"[3]. And, if the direction of the coils be determined by their relation to the back and belly of the framer of the shell, no other interpretation can be given of such relation as it is exhibited in *Spirula* (Plate LX. fig. 4) and *Nautilus* (ib. fig. 3) respectively.

It is, however, to the exposition and characters of the extraordinary number and manifold variety of the extinct Cephalopods, now known only by their polythalamous and siphonated shells, that an exact and accepted determination of their relative position to the body of the framer is most needed.

In the year 1829 Leopold von Buch initiated, in his notable memoirs on the Ammonites[4], the definition and nomenclature of the shell-characters by which the species, genera, and families might be defined.

Assuming, and correctly in my judgment, that the shells of an Ammonite and a Nautilus were coiled in the same direction, he premises:—"Le caractère distinctif entre ces deux genres de Céphalopodes, consiste en ce que le syphon des Ammonites est toujours *dorsal*, et qu'il ne l'est jamais dans les Nautiles"[5]. Next, calling attention to the lobed and foliaceous sutures of the Ammonitic shells, he defines the parts which he calls "lobes" and "selles" (saddles)—specifying of the former, "*le lobe dorsal*," "*le lobe ventral*," and "*les lobes latéraux*"[6]. Von Buch's descriptions and figures admit of no

[1] "Mollusca," Part 1, 4to, p. 6, pl. iv.
[2] Memoir on the Pearly Nautilus, &c. 4to, 1832.
[3] Palæontology, 8vo, 1861, p. 97.
[4] Annales des Sciences Naturelles, 8vo, tome xvii. p. 267, tome xviii. p. 417.
[5] Ib. p. 268. [6] Ib. ib.

doubt as to his conclusion that the outer convex curve was the "dorsal" one, the inner concave curve the "ventral" one, in both *Nautilus* and *Ammonites*.

Such, indeed, seemed the obvious relations to back and belly of the Nautilus-shell before the structure and position of its framer were made known. And it should be remembered that my conclusions on the latter point were inferential, a mere fragment only of the shell having been left attached to the unique specimen submitted to my scalpel in 1832.

Accordingly, in 1835, M. DE BLAINVILLE[1], adopting Von Buch's view of the "dorsal" position of the siphuncle in *Ammonites*, and conceiving the shell of *Spirula* to be convoluted in the same direction as in *Nautilus*, characterizes its siphuncle as "ventral," and that of the Ammonite as "dorsal."

In his applications of these views of relative position to the Ammonites, with little change of the families into which these fossils had been arranged by Von Buch, he proposes new names for them, and adopts the shape and proportions of the outer curve or border of the shell as the family characters. Thus, when such outer, and in my view *ventral*, curve of the shell is broad, as in *Ammonites dilatatus*, a family of "*A. latidorses*" is diagnosed; a reverse proportion, as shown in *Ammonites discus*, characterizes the family "*A. compressidorses*;" but neither these families, nor those of the "cavidorses," "cristidorses," "lævidorses," &c. have gained currency or acceptance.

ALCIDE D'ORBIGNY[2] adopts the view of relative position, the terminology, and in the main the classification proposed by Von Buch.

By MORRIS[3] and ANSTED[4] the aspects of the Nautiloid and Ammonitoid shells propounded by Von Buch are retained. Prof. Ansted associates *Spirula* with *Nautilus* in his family NAUTILACEA, and writes:—"The next point of difference to be attended to is in the siphuncle; and it is one both of position and magnitude. In the genera of the first family, NAUTILACEA, this important part is sometimes ventral, or on the inner margin, more frequently central, and is very rarely observed to approach the dorsal or outer margin. On the other hand, it is almost always very near the dorsal margin in the AMMONEATA, and sometimes is actually placed outside, in a channel opened for it, and projecting from the back of the shell in the shape of a keel"[5].

In fact, to have propounded that the siphuncle in the Ammonitidæ was *ventral*, as in *Spirula*, would have implied that the shells were coiled in reverse directions—an assumption seemingly held to be too

[1] Prodrome d'une Monographie des Ammonites, 8vo, 1840.

[2] Paléontologie Française, 8vo, 1842, p. 185:—"Les lettres suivantes, les mêmes que celles qu'emploie M. de Buch, indiquent toujours les mêmes parties dans les figures—*e. g.* D. lobe dorsal, V. lobe ventral," &c.

[3] "On some new Species of the Genus *Ancyloceras*" ("The ribs ornamented with two conical tubercules on the dorsal part"), Ann. & Mag. of Nat. History, 1845, vol. xv. p. 32, pl. vi. figs. 3, *a*, *d*.

[4] Observations on the Animals inhabiting multilocular Shells, 8vo.

[5] Ib. p. 278.

extravagant for adoption. And yet, if the Ammonite was tetrabranchiate like the Nautilus, no other conclusion could logically be drawn.

Accordingly, such view is formally repudiated by the experienced zoologist Dr. J. E. Gray, in his paper "On the Animal of the Spirula"[1]. "The examination," he writes, "of this animal confirms me in the opinion which I expressed in the 'Synopsis of the British Museum' (1840, p. 149), that the Ammonites, from their texture and the small size of the last chamber, are internal shells and should be arranged with the decapodous Cephalopods, being chiefly distinguished from the *Spirula* by the siphon being always on the dorsal margin of the whorls and the septa foliated on the edge. I am aware," he adds, "that this opinion is not in conformity with the ideas of many zoologists and comparative anatomists; for Mr. Owen, in the last arrangement of these animals (Todd's Encyl. Comp. Anat.), though he places the *Spirulæ* with the *Dibranchiate* Cephalopods, places the *Ammonites* with the *Tetrabranchiate* next to *Nautilus*" (p. 259).

Before recapitulating the grounds on which it was inferred that the *Ammonitidæ* were external shells, I will, finally, cite the valuable Memoirs of the Geological Survey of India, published under the direction of the accomplished and lamented Superintendent of the Survey, Thomas Oldham, LL.D., F.R.S., in which the sanction given to the views of Gray and before-cited authors as to the aspects of the shells of the Ammonites has mainly induced me to offer the present elucidation of the grounds on which I still hold the contrary opinion, viz., that the siphuncle in the *Ammonitidæ* is "ventral" or "margino-ventral," as it is in *Spirula*, but that it is "external" in the one and "internal" in the other, through the reversed direction of the spiral whorls.

In the "Monograph of the Cretaceous *Cephalopoda* of Southern India," the preparation of which was confided to the accomplished naturalist F. Stoliczka, too early lost to science, he premises the following characters of the *Ammonitidæ*:—

"Animal not known: shell spiral, more or less involute with numerous regularly (?) and gradually increasing whorls in the same plane, many-chambered, the last or body-chamber extending generally over about two thirds of the last whorl. The margins of the septa are deeply divided into lobes and saddles, the first having their subdivisions always pointed, the latter more rounded. The *dorsal* lobe is divided by a small saddle into two parts, corresponding to the siphuncle: in the regular forms of Ammonites this is always placed in the middle of the back; the siphuncle is also similarly placed inside the shell."

It is to be observed, however, that the author associates the *Ammonitidæ* in the same order "Tetrabranchiata" with the *Nautilidæ*; and it would seem therefore that he entertained the doubts originally expressed by Gray[2] and supported by Grant[3] as

[1] Annals and Magazine of Natural History, vol. xv. 1845.
[2] Phil. Trans. 1833, p. 774.
[3] My description and figures were called in question, with more detail, by

to the correctness of the position assigned by me to the soft parts of *Nautilus* in the shell[1]; but the sole reason assigned by Stoliczka for adhering to Von Buch's view of the position of the shell and his consequent denomination of its parts is the following:—"Our descriptions are of the shell (*Am. testa*), not of the animal which was living in it, and which we know not"[2].

We shall never know the organization of that animal *ex visu*. But there are, in respect of the Ammonite as of most extinct animals, other sources of knowledge in kind and degree sufficient to decide such a question as the relations of soft parts to shell in a Molluscous species.

With regard to those relations in *Nautilus* I may merely cite the subjoined works on its anatomy confirmatory in the main of my own, and fully so in regard to the relative position of the soft parts to the shell[3].

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the accomplished Professor of Comparative Anatomy in University College, Dr. Robert E. Grant, F.R.S., and begat a general belief, in 1833, that I had placed the animal of the Pearly Nautilus in a position the reverse of the real one, in the 'Memoir' of 1832. In the report of the Lecture on the Shells of the Cephalopoda, given in the 'Lancet,' vol. i. 1833, with the sanction and revision of the Professor, Dr. Grant remarks:—

"The exact position of the animal in the recent *Nautili*, *Spirulæ*, and other polythalamous spiral shells, although important in the interpretation of the fossil forms, has not yet been satisfactorily observed by naturalists. In our present uncertainty, therefore, regarding the position of the living Cephalopods in these convoluted shells, we can only be guided by analogy."

That which guided Dr. Grant to his conclusion he illustrated by figures of sections of the external shell of *Nautilus* and of the internal shell of *Sepia* (p. 506), and explained them as follows. Comparing the layers of the "cuttle-bone" to the septa of the Nautilus shell, he states:—"These layers begin in the *Sepia* by forming a small hollow shell, which receives into its interior another hollow shell; this receives within it a third and a fourth hollow shell; and so they go on in the first stages of its growth. If these cones continued thus to extend outwards, and with an oblique direction, turning on the same vertical plane, they would have formed a convoluted suborbicular shell, like that of the Ammonite or the Nautilus. Where, then, in this so convoluted shell of the Sepia, would have been the convex outer border of the shell, or the upper lip, with relation to the body of the Sepia? The Sepia would have looked forwards over the spire from the last-formed chamber, keeping the exterior convex part of the chamber" (answering to B in fig. 3) "or the upper lip extending across its back, as in all other known orbicular shells of Pteropodous and Gasteropodous Mollusca." (P. 509.)

[1] Memoir, *ut suprà*, pp. 12, 44, pl. i.

[2] *Op. cit.* p. 44. So, likewise, affirms a later writer:—"We have *only the shells* preserved to us. We know nothing of the animals."—H. Woodward, Geol. Mag. vol. v. p. 497.

As well might it be affirmed of *Anoplotherium*, e. g.:—"It must always be borne in mind, when arguing from these early fossil remains, that we have *only the skeleton* preserved to us. We know nothing of the soft parts."

[3] Valenciennes, M. A. "Nouvelles Recherches sur le Nautile flambé (*Nautilus pompilius*, Lam.)," Archives du Muséum d'Histoire Naturelle, Paris, 4to, tome ii., 1841, p. 275, pls. viii., ix., x.

Van der Hoeven, J. "Contributions to the Knowledge of the Animal of *Nautilus pompilius*," Trans. Zool. Soc. vol. iv. p. 21, pls. 5, 6, 7, 8.

Vrolik, W. "Lettre sur quelques points de l'organisation de l'animal du Nautile flambé," Mémoires de la Soc. Linnéenne de Normandie, tom. x., 4to, 1855, pp. 1–18, pls. i. and ii.

A colleague of Stoliczka, accepting the recorded structure and relative position of *Nautilus*, frames his nomenclature of the parts and aspects of the fossil shells of the *Nautilidæ* accordingly[1], the grounds for such being those of positive or direct evidence from dissection. I am led, therefore, to submit remarks on the guiding knowledge in regard to the structure and shell-relations of the extinct Ammonites, which may be gained from negative or inductive testimony.

J. E. Gray, we have seen, deemed that testimony to be such in kind and amount as to warrant his rejection of the affinity of *Ammonites* to *Nautilus*, and his adoption of the association of *Ammonites* with *Spirula* in the Dibranchiate order of Cephalopoda.

Examples of unmutilated Ammonite shells are, indeed, very rare; seldom is a specimen acquired with any considerable proportion of the last chamber. Yet some such were to be seen in an accessible museum in London long anterior to 1845.

A bisected specimen of the *Ammonites obtusus*, Sow., in the Hunterian collection (No. 188), shows well the extent of the last or inhabited chamber of the shell, and the effects of the influence of the animal matter of the decaying Cephalopod upon the petrifactive processes after death. The liassic clay has penetrated as far as the retracted soft parts of the Ammonite permitted; the decomposing mollusk has been partially replaced by crystals of spar discoloured by the pigmental or carbonized parts of the animal; the spar which has more slowly infiltrated through the pores of the shell into the air-chambers is of a much lighter colour.

In the same collection may be seen exemplifications of injury and repair of the cell. In No. 195, *Ammonites goliathus*, D'Orb., from the Oxford Clay, a portion of the shell, at the period when it formed the dwelling-chamber, "had been broken away during the lifetime of the animal, and has been repaired by fresh material, wanting the ribbed structure of the originally formed shell"[2].

The reparation closely resembles that which recent Nautilus-shells occasionally present, and which we know was effected by the formative border of the mantle reflected over the last chamber and applied to the fractured part. No such process could take place in *Spirula*, the mantle of which is muscular, and inapplicable to the last chamber. There is no need of a living Ammonite to assure us that its mantle, like its porcellano-nacreous shell, had the same structure as that of the living Nautilus.

[1] Memoirs of the Geological Survey of India, 4to, 1866. "The Fossil Cephalopoda of the Cretaceous Rocks of Southern India: *Belemnitidæ—Nautilidæ*," by HENRY F. BLANFORD. "Throughout the following descriptions I have employed the terms *ventral* and *dorsal* strictly with reference to the position of the animal, and therefore in an opposite sense to that in which they were used by palæontologists before the anatomy of the animal was known," p. 7. (And Mr. Blanford might have added "long after."—R. O.)

[2] Catalogue of Fossil Invertebrata, Mus. College of Surgeons, London, 4to, 1856, p. 43, in which work I described upwards of 350 specimens, illustrative of the different families and genera of *Ammonitidæ*, collected by JOHN HUNTER in the last century.

The perfect specimen (Plate LX. fig. 1) of the last chamber of the Ammonite was derived from that eminently conservative matrix, the lithographic slate of Solenhofen, Bavaria. The extent of the outer curve of the dwelling-chamber to the outer border of its floor (the last septum, *x* to *y*) is 4 inches; the extent of the outer curve of the chambered part of the shell to the inner border of the chamber-floor (last septum, *y* to *z*) is 6 inches. In the *Nautilus pompilius* transmitted in its perfect shell to Prof. Vrolik the corresponding admeasurements are 7 inches 9 lines and 11 inches 6 lines. The correspondence in the proportion of the dwelling-chamber to the camerated part of the shell in the Ammonite and Nautilus is thus, as in numerous other instances, shown to be instructively close.

In the last chamber of *Ammonites lingulatus*, moreover, as if to proclaim to the most sceptical its function of lodging its constructor, is preserved the only fossilizable part of such (ib. fig. 1, *o*).

Since the publication of the 'Paléontologie' of Pictet[1], who refers the Trigonellites to the Cirripeds, abundant evidence has been obtained of the accuracy of the opinion of Volz[2], that the *Trigonellites* of Parkinson[3] (*Aptychus* of v. Meyer[4]) were parts of the animal of the Ammonite, and stood in opercular relation to the shell of that extinct Tetrabranchiate. Pictet takes no note of the confirmation contributed by Morris to the Volzian examples of Trigonellites within the last or dwelling-chamber of *Ammonites*, in the portion of an *Ammonites walcotti* in which "the *Aptychus*, of a corneo-calcareous nature, was found imbedded in the matrix filling the last chamber about 6 inches from the aperture"[5].

This common, though not constant, position led some palæontologists to surmise that the Trigonellites might be parts of the *Ammonites*' gizzard, like the triturating plates in *Bulla lignaria*. M. Valenciennes believed them to be lateral supports of the funnel[6]. Van der Hoeven "hazards the opinion that the two juxtaposed fossil shells, known by palæographs as *Aptychus*, were two shelly supports of the hood of *Ammonites*" (Trans. Zool. Soc. vol. iv. p. 22). In this opinion I concur; but it has been rejected by some experienced students of the extinct polythalamous shells. Keferstein and Waagen[7], *e. g.*, deem the Trigonellites to be sexual characters, and to have served as protective plates of the nidamental glands of the female Ammonite. Waagen adduces, in support of this view, the

[1] Traité de Paléontologie, &c., vol. ii. p. 551, 8vo (1854).

[2] "Sur le *Belopeltis*," in Mémoires de la Soc. d'Hist. Nat. de Strasbourg, tome iii. (1836).

[3] 'Organic Remains of a Former World,' 4to, 1811, p. 184, pl. xiii. figs. 9–12.

[4] Nova Acta Acad. Nat. Cur. t. xv. pt. 2, p. 125, pl. lviii. (1831).

[5] "Note on *Aptychus*," in Ann. & Mag. Nat. Hist. vol. x. (2nd ser.), p. 356, pl. v. D. fig. 1.

[6] "Je crois qu'il faut admettre que l'entonnoir de l'ammonite, s'il était formé de deux valves, ne contenait pas de cartilage interne; mais que cette pièce était remplacée par un organe extérieur composé de deux pièces paires symétriques comme le sont les aptychus."—Ib. p. 304.

[7] "Ueber die Ansatzstelle der Haftmuskeln beim Nautilus und Ammoniten," Palæontographia, 4to, p. 185, taf. xxxix., 1871.

correspondence of the relative position of the *Aptychus*[1], in the body-chamber, to that of the nidamental glands of *Nautilus pompilius*[2] to the shell; and he deems each valve of *Aptychus* to have been applied to a lateral lobe of the nidamental gland[3]. But these lateral lobes are divided from each other by a part of the middle lobe[4], while the valves of the *Aptychus* are usually in contact (as in Plate LX. fig. 1, *o*), or may be suturally united along the mid line (as in ib. fig. 2, *o*). But to return to Waagen's argument from position in the fossil shell. In the course of decomposition after death the calcareous plates would be likely to gravitate or sink deeper into the body-chamber than their natural position in the living Ammonite. So sinking, they would rather lodge or settle in the hollow of the outer (ventral) wall of the body-chamber (B) than upon the involute convexity on the opposite (dorsal) wall (A). Moreover there are examples (as in Plate LX. fig. 2) in which the Trigonellites (*o*, *o*) have been found in an opercular relation at the mouth of the shell. And, considering the movements to which an Ammonite must have been subject from the time of its death to the solution of the soft parts and final imbedding of the shell in the matrix or seat of its petrifaction, one is prepared for the rarity of the conservation with the shell of its loose operculum, and for the still more rare retention of the *Aptychus* in its original position. Waagen admits that there are five specimens of Ammonite in the Munich collection exhibiting this position[5]. He, however, contends that the breadth of the aperture of the body-chamber is less, in certain Ammonites (*A. steraspis*, e. g.), than the united breadth of the aptychal plates. But so, likewise, if the side lobes of the hood of *Nautilus*[6] were outstretched horizontally, it would exceed the breadth of the outlet of the dwelling-chamber in *N. pompilius*. But the side lobes of the hood are bent back obliquely in order to close the dorsal side-curved borders, or notches, of that part of the shell-aperture, just as the aptychal lobes or valves are bent down in Plate LX. fig. 2, *o*, *o*.

It may be further remarked, in respect to the nidamental glands, that they are subject to seasonal changes, and gain the relative bulk with which the size of the aptychal plates accord only at the period of discharge of the impregnated ova, for which they have to furnish the protective coat or nidus. Such seasonal change is exemplified in the figure of these glands given in the 'Memoir on the Nautilus' of 1832, and in that which is shown in Taf. xix. of Waagen's Treatise, 1871. Moreover, in not one of the existing genera or species of Cephalopod, *Nautilus* included, in which these glands are superadded to the more essential organs of generation, are they encumbered in any way or degree with such calcareous plates as Keferstein's hypothesis applies to them in the Ammonite.

[1] Palæontographia, 1871, taf. xl. fig. 4.
[2] See Memoir on the Nautilus, 1832, pl. i., *e*.
[3] Ib. pl. viii. fig. 10, *b*, *b*.
[4] Ib. ib. *a*.
[5] "Unser Museum besitzt gegen 100 exemplare von Ammoniten mit erhaltenen *Aptychus*; unter dieser ganzen Anzahl sind 5, welche den *Aptychus* in senkrechter Stellung am Ende der Wohnkammer liegend haben" (*op. cit.* p. 192).
[6] Memoir on the Nautilus, 1832, pl. iii. fig. 1, *g*, *g*.

In the application of the anatomy of the constructor of the Pearly Nautilus to the solution of the problem of the nature and function of the Trigonellites, I was led to regard them as the homologue of the organ, or a portion of the organ, in *Nautilus*, which is "of a fibrous texture, resembling dense corium," called from its shape and position the "hood" (Plate LX. fig. 3, *e*), and which, when the animal had withdrawn into its dwelling, "would serve as a rigid defence at the outlet of the shell"[1]. It needed only that this part should be more or less calcified to form the preserved portions of an operculum like that ascribed to the Ammonite. If, for example, calcification had commenced in each half of the symmetrical "hood," and had stopped at the mid line (where the hood is thinnest), the pair of the there-often-suturally-joined symmetrical pieces of the *Aptychus* would have resulted. The relative size of *Aptychus* agrees with that of the shell. It has been found to measure 7 inches 6 lines in length and 6 inches in breadth in gigantic Ammonites[2]. It may be doubted whether the nidamental glands ever increased in the same ratio; and it is still less likely that they needed such defensive plates in their season of rest and attenuation.

If, therefore, my homology of the symmetrical halves of the *Nautilus*' hood with the parial Trigonellites (*Aptychus*, v. M.) be preferably accepted, the supposition that these parts are calcifications of an Ammonite's hood may be deemed reasonable. That the fibrous basis of the hood was retained in different degrees in the Ammonites is indicated by the simply corneous or chitinous condition of the *Aptychus* which has been preserved in some examples of *Ammonites falcifer*, Sow., and its allies. In other species, as in the *Ammonites lingulatus* (Plate LX. fig. 1, *o*), the lateral calcifications have partially met and joined at the mid line; in a third series these opercular plates are thicker and are there suturally united. This is the case in the small or young specimen of *Ammonites subradiatus*, Sow., in the British Museum, which is described and figured by S. P. Woodward, F.G.S., in 'The Geologist'[3]. As the view of the specimen there given is an oblique side one, I here append a direct view of the aperture of the dwelling-chamber as closed and protected by its operculum (Plate LX. fig. 2, *o*). The correspondence of general shape with that of the "hood" of the *Nautilus pompilius*, as figured in plate iii. fig. 1 of my 'Memoir,' is close[4].

The conjoined plates of the *Aptychus* (ib. fig. 2, *o*, *o*) form a triangular disk, of which the base is backward, excavated to receive the involute part of the shell, *p*, with the sides of the base, like the corresponding lobes of the "hood," bent down to cover the laterally extended parts of the wider terminal coil of the shell, *q*. Even in the contrast between the papillose wrinkled outer surface and the

[1] Memoir on the Pearly Nautilus, 1832, p. 12, pl. i. *n*, and pl. iii. fig. 1.

[2] See de Zigno, Memorie del R. Istituto Veneto, tom. xv. tab. viii., 1870.

[3] 8vo, 1860, p. 328.

[4] Woodward gives the following description of its ammonitic homologue:—"The operculum is flat in the middle, with a slight furrow along the suture, and is much bent down at the hinder corners, where it abuts against the inner whorl of the shell. It is sculptured externally with about twelve angular concentric furrows; the inner surface is smooth."—*Ib. ib.*

smooth inner surface of the "hood" of *Nautilus* the resemblance to the "Aptychus" of the Ammonite is carried out. Anterior to the apex of the triangular operculum in the *Ammonites subradiatus* a small portion of the dwelling-chamber (ib. *v*) is left uncovered, through which a slender stream of water might pass from the retracted funnel.

As the soft parts of the *Ammonites lingulatus* decayed and were dissolved the calcareous or opercular parts of the hood (ib. fig. 1, *o*) have subsided to near the bottom of the dwelling-chamber, probably with such change of their original relative position, as exemplifies the value of the demonstration given in the specimen described by Woodward. If an independent centre of calcification were set up in the mid region of the "hood" (*Mem. cit.* pl. iii. fig. 1, *f*), a part corresponding to the *Anaptychus* might result.

In further ventilation of the mooted affinity of *Ammonites* to *Spirula*, it may be remarked that in not one of the examples of *Ammonites* in which the dwelling-chamber has been in any proportion preserved has there been any trace of an ink-bag. Yet fossilization of this or of its secretion is abundantly exemplified in the extinct Belemnites[1]. Hence the inference may as confidently be drawn, as from a dissection of the animal of the Ammonite, that this Cephalopod lacked, like the Nautilus, the singular defensive contrivance with which the more active Dibranchiate Cephalopods were endowed, and that the animal of the Ammonite was compensated, like that of the Nautilus, by having an external protective shell into which it could retreat and close the entry against the assaults of an enemy. Moreover, admitting the homology of the "Aptychus" with the "hood," we further learn that the defensive door of the house was "dorsal," and that the relative position of the soft parts to the external shell was the same in *Ammonites* as in *Nautilus*.

It cannot be averred, therefore, in excuse of a nomenclature implying a different and opposite relative position of the soft parts to the shell, that "the animal of the Ammonite is unknown."

To the composite porcellano-nacreous structure by which the Ammonitic agree with the Nautiloid series of shells, and their difference in this character from the simply nacreous structure of the Spirula-shell, reference is here made in illustration of the "Law of Correlation." The conformity, in this respect, with the Nautiloid series is maintained under every modification of shape from straight to convolute.

But the persistence with which monographers of these numerous and beautiful fossils, notwithstanding the appeals of Pictet[2] and M'Coy[3], and the practice of Barrande, adhere to the erroneous views of Von Buch as to which was the dorsal and which the ventral aspect of the shells, has moved me to supplement the original grounds of

[1] Buckland, Bridgewater Treatise, vol. i., 1835; Owen, "On certain Belemnites from the Oxford Clay," Phil. Trans. 1844.

[2] Palæontology, vol. ii. p. 618.

[3] Ann. & Mag. Nat. Hist., 2nd ser. vol. viii. p. 481.

my conclusions on that question by additional or confirmatory evidence from autopsy of the fabricators of the still existing polythalamous and siphoniferous Cephalopods.

Having prevailed upon Mr. Cuming, subsequently to my Monograph on the anatomy of *Spirula* in the 'Zoology of the Samarang,' to permit me to test that anatomy by dissection of his unique specimen, I proceed to point out such structural facts, confirmed by that dissection, as demonstrate the ventral position of the marginal siphon of the internal shell of *Spirula*—and to combine therewith corresponding anatomical observations on *Nautilus*, which, with the demonstrated affinity thereto of *Ammonites*, equally prove the ventral position of the marginal siphon of the external shell of that extinct genus and its allies.

The dorsal aspect of a Cephalopod is determined by the position of the brain and eyes, *i. e.* by that predominating part of the brain which sends off the optic nerves. The ventral aspect is shown by the respiratory funnel (Plate LX. figs. 3 and 4, *j*, and gills, *m*). No malacologist has questioned these conclusions. The proposition might be simplified by stating that the funnel shows the "ventral side" of the animal, and that the opposite one is the "dorsal side."

Accordingly, all who have occupied themselves with the organization of the Cephalopods have pointed out the singular reversed positions of the mandibles as compared with those in such vertebrate animals as repeat the cephalopodic condition of a "beak," as, *e. g.* *Chelonia* and *Aves*.

Instead of the dorsal or upper mandible being the largest and longest, so as to overlap the ventral or under mandible, as in birds, the dorsal mandible, *h*, figs. 3 and 4, is the smaller and shorter one, and is underlapped by the larger and longer ventral mandible, *i*, in all Cephalopods.

So, likewise, the branchiæ, *ib*. figs. 3 and 4, *m*, *m*, lie in the ventral part of the pallial cavity; and, in short, the several viscera occupy similar relations to back and belly in both Tetrabranchiate and Dibranchiate Cephalopods[1].

The aspects of the body being thus abundantly and unmistakably determined, they can be as unequivocally predicated of the shell under whatever shape or proportion it may be present.

The portion of the shell of *Nautilus* which extends from the fundus of the last chamber, along the dorsal aspect of the mantle, as from A to A′, fig. 3, is the "dorsal wall" of such shell, and so must be its continuation backwards.

The portion of the shell of *Spirula* which bears the same relation to the dorsal aspect of the body is the "dorsal wall" of the shell, A, A′, fig. 4; while that part of the last chamber which protects the ventral side of the muscular and visceral mass which it contains, small though it may be, is part of the "ventral wall" of the shell, B, and so must be its continuation as far as it extends, viz. to the "protoconch" (fig. 5, *a*) or incipient nuclear chamber.

[1] See "Supplementary Observations on the Anatomy of *Spirula*," in Annals and Magazine of Natural History for January 1879.

Accordingly, the dorsal wall, A, of the spiral shell of *Spirula* describes a convex curve, the ventral wall, B', a concave curve. In *Nautilus* the curves are reversed. If the shell of *Orthoceras* or *Baculites* were curved so as to present the same relative positions of convexity and concavity which exist in that of *Spirula*, they must have been coiled in a reverse direction to that which is presented in the shells of *Nautilus* and *Ammonites*.

Admitting that the siphon in *Ammonites* and *Spirula* are both "ventral" or "ventro-marginal," yet the relative position to the shell is so contrasted as to call imperatively for terms indicative of such contrast. And such terms are obvious. Of a convolute shell the convex curve is the *outer* one, the concave curve the *inner* one, whatever may be the relative position of its constructor.

Had Von Buch been content to call those curves in a convolute Ammonite "external" and "internal," and to define the position of the siphon as "externo-marginal" and "interno-marginal" respectively, his terminology would have stood and been unquestioned to the present day. But he proceeded to a conclusion as to their relations to the constructors of the shells; and, as no specimen of either a *Nautilus* or a *Spirula* had been dissected in 1829, such conclusion could only be a guess.

So probable, however, seemed the guess, that his most experienced contemporaries, De Blainville, Grant, and Gray, after the organization of the Pearly Nautilus had been made known, preferred, as we have seen, the opinion of the conchologist to that of the anatomist, and deemed the latter to have reversed the true position of the animal of the *Nautilus*[1]. And, with most[2], the nomenclature of the parts of the shell of the *Ammonitidæ* has continued in concordance with that opinion to the present day.

If, however, the facts and inferences now submitted to the Zoological Society should be accepted with their logical applications in conchology, and the siphon in both *Ammonites* and *Spirula* be acknowledged to be "ventral," or "ventro-marginal," nevertheless the different positions of the siphon in these shells and in that of *Nautilus* demand to be defined by distinctive terms. And these are easy, obvious, and incontrovertibly applicable. The siphon in the *Ammonitidæ* is "external," "externo-marginal," or "ecto-marginal." The siphon in *Spirula* is "internal," "interno-marginal," or "ento-marginal." The siphon in the *Nautilidæ* may be "central," or "subcentral;" and if the latter, either "ectocentral" or "entocentral," according as it deviates from the typical central position toward the

[1] See notes 2 and 3, p. 957.

[2] Even in S. P. Woodward's classical 'Manual of Mollusca,' 12mo, "dorsal" and "ventral," are used as synonyms of "external" and "internal." Thus the genus *Ammonites* is characterized by "siphuncle dorsal" (p. 94, and p. 197, ed. 1868). The genus *Goniatites* is characterized by "siphuncle dorsal" (p. 93). The experienced Editor, in a later edition of the 'Manual of the Mollusca,' in his 'Appendix' (12mo, 1868) approximates to the conclusion here advocated, by amending the character of Fam. iii.—*Ammonitidæ*, thus:—"Siphuncle—convexo-marginal?" (p. 10). If the present paper should serve to dissipate Mr. Tate's remaining doubt it will be an acceptable return for my labour.

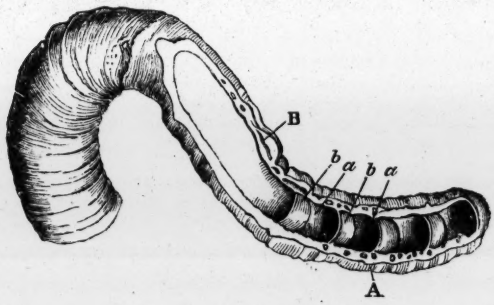
external or internal part of the shell: in some rare cases (*Cryptoceras*) the siphuncle is ectomarginal, as in *Ammonites*; and in still rarer instances (*Clymenia*) it is entomarginal, as in *Spirula*. There are also species in which it begins by being marginal, and gradually shifts to the more typical position as the shells grow and the number of the septa increases.

In the *Nautilus imperialis*, e. g., the siphuncle is at first, i. e. along the first twenty chambers, entomarginal, or near the concavity of the shell-curve, as in *Spirula*; but in opposite relations to the back and belly of the animal. After the twentieth chamber the siphuncle gradually gains the central or excentral position[1]. *Nautilus ziczac* shows a similar structure. The immature position of the siphon in the existing *Nautilus* was longer retained in the old Tertiary species.[2]

Various suggestions have been made as to the efficient as well as final cause of the successively vacated parts called "chambers," with their partitions and connecting siphon, in the polythalamous and siphoniferous shells of Cephalopods.

In elucidation of this question, much mooted by different writers[3]

Fig. 1.



Vermetus gigas.
Section of chambered part of shell.

after the publication of my Memoir on the Pearly Nautilus, I adduced the instances of such vacuities or chambers in the Mollusca,

[1] Catalogue of Hunterian Cephalopoda, 4to, no. 137, p. 32.

[2] See the just remarks of Barrande on the variation of the siphuncular character in certain nominal species (Céphalopodes Siluriens de la Bohème, 8vo, 1867, p. 24).

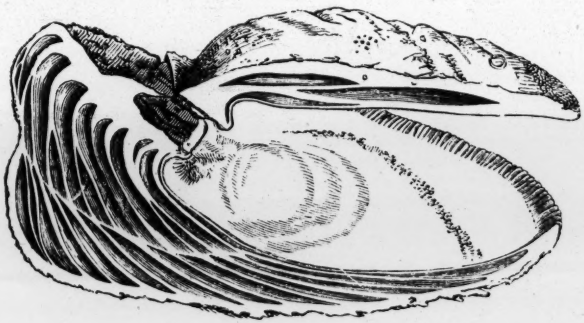
[3] Buckland, 'Geology and Mineralogy considered with reference to Natural Theology.' 1835, vol. i. p. 329. De Blainville, "Sur l'usage du siphon des coquilles polythalames," Annales françaises et étrangères d'Anatomie et de Physiologie, t. i. 1837.

as, e. g., *Fistulana clava*, *Vermetus gigas*, *Helix decollata*, the *Ostreæ*, *Estheriæ*, and other Bivalves, more especially the *Spondylus varius*[1].

In *Fistulana* and the gastropodal *Vermetus*, the animal periodically withdraws itself from its dwelling-chamber; the growth of the walls is continuous and uninterrupted; but a thin new floor is formed at some distance from the old one left behind, and a series of chambers fig. 1, *a a*, results. If the calcareous deposit had been continuous in every part of the shell, a solid tract would have been left behind, as in *Magilus*. The successive floors or "septa" in *Vermetus* (fig. 1, *b b*), extend freely across and are concave toward the outlet; they are entire and adherent only by their marginal circumference to the shell-wall (A, B). The contents of the chambers in the living *Vermetus* are unknown. Both chambers and partitions are the consequence of a mode of shell-growth; physiological ken stretches not beyond this.

In *Spondylus varius* (fig. 2) the "septa" are not continued freely across the shell, but are united together near the middle or centre of their extent, at the position of the impression of the adductor

Fig. 2.



Spondylus varius.
Section of chambered part of shell.

muscle. This, in the forward movement of the mollusk, does not quit its attachment to the nacreous layer of the valves; whilst the pallial lobe, except at its circumference and where it adheres to the adductor, can and does detach itself from the surface of the valve about to be abandoned, in the progressive growth of the visceral mass. The mantle at each period of repose, then secretes on the fluid occupying the deserted part of the shell, the new septum or

[1] Proc. Zool. Soc. 1837, p. 63. See also H. Woodward, "On the Structure of the Shell of the Pearly Nautilus," Report of the British Association, Liverpool, 1870, Trans. of Sections, p. 128.

basis of support of the mollusk. Thus the septa, as they are successively formed, adhere, not only to the circumference of the growing valve, but to a central part of the preceding septum, and for an extent more or less corresponding to the circumference of the correspondingly advancing adductor muscle.

If the adductor were a tube instead of a solid mass, the central confluent part of the septa would be perforated, and a siphon would result, the calcareous walls of which would be continuous, as in *Spirula*, *Nautilus striatus*, the Orthoceratites, &c.

The contents of the deserted chambers in *Spondylus varius* are sea-water with an increased proportion of the saline ingredients.

The efficient cause of the forward movement of the *Spondylus varius* appears to be the need of a shell of a size suitable to the growing bulk of the animal, coupled with the frequent fixation of the lower valves of the young shell to an overcrusting mass of coral, in advance of which the growing shell must increase. Such increase and the testaceous provision for it are not, therefore, attributable to special expansion of one organ, but to the concomitant growth of the whole of the soft parts of the Palliobranch.

It has been suggested that the periodical increase of the ovarium or testis might initiate and constrain the forward movement of the soft parts in the Cephalopods with chambered shells, and that a polythalamous structure is related conditionally to the generative function[1].

But it will be observed, in both *Spirula* and *Nautilus*, that the formation of the chambers commences from the embryonal cup (protoconch, fig. 5 *a*, p. 973), and continues through an early period of growth antecedent to the acquisition of the procreative function, or the adult stage of existence—and, moreover, that those early chambers are relatively deeper[2] than the succeeding ones, indicative of a more extensive forward movement of the soft parts, in accordance with the more rapid growth of the animal which characterizes the period of nonage, when all the assimilative functions are concentrated on general increase and no degree of that power is diverted to the development of special organs, such as the testis or ovarium.

The last or open chamber of *Nautilus*, and, by analogy of size and certain known contents, in *Ammonites*, was occupied by the entire soft parts. In *Spirula* it contains only the hind end of the liver and portions of the origins of the retractor muscles of the head and funnel. It has been stated to contain the ink-bladder in *Spirula*[3]; but in my dissections of that Cephalopod made subsequently to that detailed in the 'Zoology of the Voyage of the Samarang,' I find the same positions and relations of the ink-bag as are described and figured in that monograph[4].

[1] Prof. Seeley, Proceedings of the British Association, Bath, 1864, Section Zoology, "Nautiloid shells," 8vo, p. 229.

[2] By depth is meant the diameter from septum to septum; by breadth that between wall and wall.

[3] Woodward, 'Manual of Mollusca,' p. 77.

[4] "A very minute pyriform ink-bag, *z*, is situated close to the rectum; and its duct opens within the verge of the anus" (p. 10, pl. iv. fig. 11).

As to the function or "final cause" of the chambers, I hold by the opinion expressed in my original memoir[1] and in the 'Catalogue of the Fossil Cephalopoda in the Hunterian Museum,' 4to, ed. 1856[2], viz. that they so affect the specific gravity of the active, highly organized, cephalopodous mollusk, as to enable it with little effort to rise, in the case of the *Nautilus*, from its habitual position at the bottom of the sea—and in the case of the *Spirula*, to sink from its more usual zone at or near the surface,—such vertical movements being executed, like the horizontal ones, by means of the hydrostatic mechanism worked by the muscular forces of the mantle and funnel.

The contents of the vacated chambers in *Nautilus pompilius* are stated to be nitrogenous gas. Neither the contents nor the vital properties of the siphuncle are yet known; an artery and vein are assigned for its life and nutrition, and to extend a low degree of the vivifying influences to the shell. Vrolik confirms the existence of the siphonal artery described and figured in pl. vi. fig. 1, 14, of my 'Memoir,' and repeats this illustration in his pl. i. fig. 2, "*i*, artère allant au siphon"[3].

The siphonic artery sends off, according to Keferstein, branches to the mantle which lines the bottom of the body-chamber before penetrating the siphon. Waagen figures the impression of these arterioles on the shell-surface[4]; and it has been suggested that these vessels may supply, by secretion, the chamber-gas which I inferred might occupy the space left free on the recession of the visceral sac from the chamber-floor prior to the formation of a fresh septum[5].

Thus, in the analysis of the structure of chambered shells, we find:—septa simple, distinct, attached only by their circumference (woodcut fig. 1, p. 966); septa attached, subcentrally, to each other, as well as by their circumference to the shell-walls (fig. 2, p. 967); septa (fig. 3 *b*, p. 907) attached marginally to the shell-walls, A, and also to each other by tubular prolongations, *c*, with an organized, vascular, membranous canal, *d*, traversing such testaceous tube; septa with a calcareous siphuncle consisting of a series of superimposed, elongate, funnel-shaped tubes, with the wide end directed toward the aperture of the shell, as in *Spirula* (fig. 4, p. 971), or in the opposite direction, as in *Bathmoceras*. The more complex siphons of Orthoceratites will be presently referred to. Finally, we see in the existing Nautilus the shelly tube interrupted, forming the "collar of the siphon," and the septa and chambers traversed by a lime-coated membranous canal running through the interrupted shell-tube (Plate LX. fig. 3, *c*, *d*).

[1] "From the adhesion of the entire circumference of the mantle to the shell by means of the 'horny girdle' ('*annulus*,' Waagen, op. cit.), I am inclined to suppose that the whole of the chambers are excluded during the life-time of the animal from external influence, and are filled only by exhalations or secretions from the animal."—*Memoir on the Nautilus* (1832), p. 47.

[2] "The proportion of the air-chambers to the occupied dwelling-chamber of the Nautilus is such as to render the whole animal of nearly the same specific gravity as the surrounding water."—*Catalogue*, p. 29.

[3] Mémoires de la Soc. Linnéenne de Normandie, tom. x. 1855, p. 17.

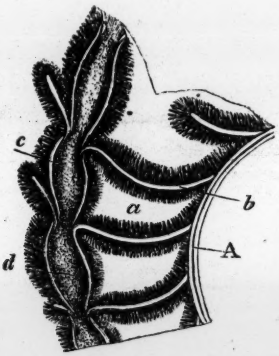
[4] Waagen, *op. cit.* Taf. xxxix. fig. 4.

[5] *Op. cit.* 4to, 1832, p. 47.

For the different views which have been propounded as to the nature and function of this complex siphon, reference may be made to the authors cited, p. 966. Some of these views were based on the partial knowledge of its structure at the date of the first dissection of the Pearly Nautilus.

The true structure of the siphon in *Nautilus pompilius* is rarely preserved; the somewhat loose calcareous matter by which the membranous part is incrusted is commonly lost with that part in the dry cast-off shells. The calcareous incrustation is apt to be dissolved, like that of the mandibles in Valenciennes's specimen, by the acetous change of the alcohol when charged with soluble parts of the animal during a prolonged transit to a European museum.

Fig. 3.



Nautilus striatus.
Section of part of shell.

When cataloguing, in 1854 and 1855, the Hunterian Cephalopods, I saw sufficient to supplement the description of the siphon in the 'Memoir on the Nautilus,' as follows:—"An artery and vein are assigned for its life and nutrition, and to extend a low degree of the same influences to the shell; but the structure of the membranous siphuncle presents, beyond the first chamber, an inextensible and almost friable texture, apparently unsusceptible of dilatation and contraction; it is also coated beyond the extremity of the short testaceous siphuncle with a thin calcareous deposit"[1]. The fact of this incrustation has been ascertained, independently, by Prof. Vrolik. The subject of his memoir in the volume cited in note 1, was

[1] Descriptive Catalogue of the Fossil Organic Remains of the Invertebrata contained in the Museum of the Royal College of Surgeons of England, 4to, 1856, p. 29. This volume was not issued until all the invertebrate fossils were described; and the first sheets were printed off before the 'Mémoires de la Société Linnéenne de Normandie,' vol. x. 1855, came to my hands.

in such a favourable state of preservation that the calcareous incrustation of the membranous siphon was entire, and formed the subject of the continuous inflexible composite tube represented in pl. i. fig. 5, *a*, *b*, in that accomplished naturalist's memoir. The notion of the dilating and contracting action of the siphon of the Nautilus upon its contents, whatever these may be proved to be, could be no longer entertained. Vrolik, confirming by his dissection the existence of the siphonal artery, infers, like myself, the coexistence of a returning channel, although no vein with definite tunics was demonstrable in either dissection.

Evidence of the capillary ramifications of the siphonal artery upon the pallial membrane lining, as periostracum, the interior of the shell-chambers has been adduced by the careful observers Keferstein and Waagen; but such channels of vitality are not supposed to penetrate the shell itself. Molluscous shells, like avian feathers and mammalian hairs and teeth, do not receive the terminal divisions of the blood-vessels supplying their several pulps or formative organs. Ordinary or hard dentine, like conchine, piline, and plumine, is extravascular, but not, therefore, extravital. The percolation by cellular passages and intervals of a rarer, plasmal exudation from the vital

Fig. 4.



Spirula australis.
Section of part of shell, magnified.

fluid renders intelligible the change and movements of pigment in the same hair and in the same feather. As the dentist distinguishes dead from living teeth, so the conchist regulates his estimate of the value of a "dead" as contrasted with a "living" shell. The estimable researches of Carpenter on the modifications of microscopic texture in shells parallel those that have demonstrated as many modifications of the microscopic channels by which the plasma percolates the dentinal as it does the chonchinal tissues[1].

The high organization of the Cephalopods compared with other

[1] Laborious studies of this kind in quest of truth beget a modest reticence and an abstaining from such dogmatic utterances as those of the writer who "denies the possibility of the siphuncle maintaining the vitality of the shell, because it is certainly a non-vascular structure."—"*Recent and Fossil Cephalopods*," *Geological Magazine*, vol. v. p. 490.

mollusks suggests to the physiological mind the probability that some corresponding step in advance of the ordinary condition of a testaceous defence would be likely; and the retention of the parts of such defence vacated in the course of growth, with the superaddition of a vascular by-way running through the whole, verifies such anticipation of the means whereby the camerated and siphoniferous shell is thus brought into closer harmony with the rest of the organic structure.

When the first simple, single-chambered, nuclear dwelling is added to and, in part, abandoned, a closer connexion is therewith preserved than in *Vermetus, e.g.*; and, as the artery penetrating the membranous siphon continued from the last-formed dwelling-chamber was demonstrated by mercurial injection[1], there is no reason to doubt that such organic connexion was maintained between the fabricator of the second chamber after it had advanced from and vacated the first or nuclear one.

The constancy of this siphuncular connexion running through all the chambers of the largest and most complex of the polythalamous shells, with the great size and singular complexity of the siphuncle in several extinct species, form the grounds on which I still hold to my original belief in the function of the siphuncle as related to a maintenance of the vitality of the shell. But this relation may be connected, also, with a greater share assigned to the siphon in the protection of the soft parts of the Cephalopod at the earlier stages of its existence.

The chief character of the tetrabranchiate chambered and siphonated shell is its affording, besides a sheath or case to the whole animal, a special protection to a part of the animal.

Such twofold office is performed by the shell in certain Gastropods, conspicuously in the genus *Calyptræa*, in which an accessory "cup," springing from the concavity of the larger "saucer," lodges part of the muscular system[2].

Every chambered and siphonated shell begins in this simple fashion. The protoconch is cup-shaped or flask-shaped, and includes a similar but smaller blind beginning of the siphon.

The proportion of the inner partially protecting shell to the outer wholly encasing shell is greatest in the Silurian Orthoceratites; and with the large proportional siphon are associated complexities characteristic of the genera *Ormoceras*, *Huronia*, &c.[3]

Modifications of the contents of such siphons in the Silurian *Vagi-*

[1] "The lesser aorta" sends off a small branch (14, pl. 5 & 6) "which, winding round to the ventral aspect of the ventricle (to which it is connected by a process of membrame), passes through a foramen in the septum dividing the pericardium from the cavity at the bottom of the pallial sac, is then continued through that cavity, passing between the ovary and gizzard, and lastly enters, without diminution of size, the membranous tube that traverses the partitions of the shell."—*Memoir on the Pearly Nautilus*, p. 36.

[2] "Its cavity is filled by what may be termed the apex of the foot, which here loses its muscular character, and assumes a gelatinous texture."—"*Anatomy of the Calyptræidæ*," *Trans. Zool. Soc.* vol. i. p. 208, pl. 30. figs. 2, 6*f*, 1834.

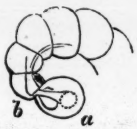
[3] Charles Stokes, in Geol. Trans. 2nd ser. vol. v. p. 706, 1837.

nati of Bohemia led the exemplary and acute observer Barrande to conceive that a larger proportion of the soft parts had been therein lodged than is the case in the slender simple siphons of other Tetrabranchiates, and in all that are of later date, when the partial office of the siphon is reduced to reception of a trace of the vascular system.

Produce both the "saucer" and "cup" of *Calypeopsis*, with the resultant "false bottoms" or septa, as in *Vermetus* (fig. 1, p. 966), and an analogue, if not parallel, of *Endoceras* would ensue.

Hyatt has noted the resemblance of the cup-like internal chambers of *Beatricea* to a line of siphonal cæca. The protoconch (primal shell, nucleus, ovisac, embryo, &c., fig. 5, *a*) has been determined,

Fig. 5.



Spirula australis.[1]

Protoconch and protosiphon, with following chambers, magnified.

described, and figured by De Blainville (in *Spirula*[1]); also by Sandberger[2], by Barrande[3], and, with exemplary care and patience, by Alpheus Hyatt[4], in various species of tetrabranchiate shells. The results by no means support any doubt as to the externality of the shells of the Ammonitidæ, or at all support the notion of their closer affinity to *Spirula* than to *Nautilus*.

The supposed well-marked distinction between the protoconch of *Ammonites* and that of *Nautilus* is mainly due, as Hyatt has shown, to its decadence in *Nautilus* after the deuteroconch (fig. 5, *b*), or successional shell-chamber, is formed—the primal communication with the protoconch being then indicated by a linear cicatrix on the first septum[5]. On this indication of the original existence and attachment of the protoconch I may remark, that when the young *Nautilus*, becoming too big for its first shell, moved on to make another, part of that "making" encroached upon the space which the young had traversed, and reduced it more or less to the shape of a chink or scar. But it must not be concluded that this chink preexisted to the progress, and that the young crept or squeezed through such chink, as when Mr. Hyatt writes of "the central scar which marks the former aperture through which the animal probably passed into the fundus of the first whorl"[6]. It is only under such impression that it becomes "difficult to account for the passage of the large

[1] *Op. cit.*
[2] Oberhessische Gesellschaft für Natur und Heilkunde, 1858.
[3] *Op. cit.*
[4] Fossil Cephalopods of the Museum of Comparative Zoology.—Embryology (8vo, Cambridge, Mass.), vol. iii. no. v. 1872.
[5] *Ibid.* p. 64. [6] *Ibid.* p. 73.

body of the embryo through the narrow aperture thus made"[1]. The difficulty merely depended upon the "time of the making" the communicating aperture so narrow.

A true "embryology" of the Tetrabranchiates will be the welcome result and reward of the fortunate and equal student of the living *Nautilus* and *Spirula*, on the shores or in the seas they still frequent, or in the aquarium adapted to conserve and exhibit the male and female of these representatives of the almost extinct order.

I cannot conclude the present paper without expressing the pleasure with which may be confidently expected the determination of important points in the physiology of the Tetrabranchiate and Dibranchiate constructors of chambered and siphonated shells by observations made on the living specimens, under the favourable opportunities afforded by their capture to the accomplished Naturalists of H.M.S. 'Challenger,' whose attention had no doubt been directed to the following needful observations and experiments suggested in previous works on the subject.

"It would be advisable in the event of another fortunate capture of the *Nautilus*, to lay open the chambers under water, when the presence of gas in any of them would be ascertained; and it might be received and analyzed; the contents also of the central tube, if gaseous, would at once be detected"[2].

Prof. Vrolik records similar appeals on more than one point in the structure and physiology of the constructor of the chambered shell.

"M. Owen a eu raison de dire que l'orifice *h* (pl. ii. fig. 2) est en communication avec le péricarde."..."D'après ce que j'ai vu, le siphon s'ouvre dans la cavité abdominale, comme la pl. i. fig. 5, *c*, le démontre, et dans laquelle j'indique aussi la communication entre la cavité branchiale et le péricarde en *d*, et entre celui-ci et la cavité abdominale ou splanchnique en *e*."..."En ouvrant la paroi postérieure du péricarde, je me suis assuré qu'au fond de celui-ci il y a une ouverture, que M. Owen a déjà reconnue, et dans laquelle pénètre une petite artère (pl. i. fig. 2, *l*). Cette ouverture est mise en rapport, près de l'ovaire et du gésier, avec la cavité abdominale."

With regard to the course of sea-water from the branchial to the pericardial or peritoneal cavity and thence to the cavity of the siphon, or the reverse course, Vrolik appeals to the fortunate possessors of the living Nautilus:—"L'observation directe seule pourrait les décider"[3].

And again, in regard to the circulation, especially of the venous blood:—"Serait-il possible que le sang veineux du canal intestinal fut versé dans ces interstices ou dans ces *lacunes*, pour passer plus tard, par les orifices cités, dans la veine cave; et le sang veineux des autres

[1] *Op. cit.* p. 74.

[2] Memoir on the *Nautilus pompilius*, 4to, 1832, p. 47. The same might be urged in the case of the capture of a living *Spirula*.

[3] "Sur quelques points de l'organisation de l'animal du Nautile Flambé." Mémoires de la Société Linnéenne de Normandie, tom. x. (1835), p. 7, pls. i. and ii.

viscères abdominaux serait-il reçu dans des vaisseaux veineux qui se réuniraient en suite pour former les troncs que M. Owen représente planche vi. 3, 3? Je n'ai pas de réponse à donner à ces questions. L'injection du système vasculaire d'un individu à l'état frais, et *l'observation d'un Nautile vivant pourraient seules les éclaircir.*"—VROLIK, *op. cit.* p. 11.

EXPLANATION OF PLATE LX.

Fig. 1. Section of *Ammonites lingulatus*, showing the opercula, *o*, displaced but retained in the dwelling-chamber.
2. *Ammonites subradiatus*, with the operculum, *o*, *in situ*, closing the aperture of the shell, save the space, *v*, for the passage of the respiratory currents.
3. Section of *Nautilus pompilius*, with diagrammatic outlines of the muscles of the shell and of the soft parts indicative of the relative position of the animal.
4. Section of *Spirula australis*.

In the figures 3 and 4 the parts are indicated by the same letters, as follows:—

Shell.

A. Dorsal wall. B. Ventral wall. *a*. Chambers. *b*. Septa. *c*. Hard siphon. *d*. Soft siphon.

Mantle.

e. Dorsal wall. *f*. Ventral wall.

Head.

g. Tentacles or prehensile organs.

Beak.

h. Dorsal mandible. *i*. Ventral mandible. *j*. Funnel. *k*. Retractores infundibuli. *l*. Retractores capitis. *m*. Branchiæ. *n*. Liver.

December 3, 1878.

Robert Hudson, Esq., F.R.S., V.P., in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during November 1878:—

The total number of registered additions to the Society's Menagerie during the month of November was 66, of which 2 were by birth, 26 by presentation, 28 by purchase, 1 received in exchange, and 9 received on deposit. The total number of departures during same period, by death and removal, was 89.

The most noticeable additions during the month were:—

1. Two examples of Horsfield's Tortoise, *Testudo horsfieldi*, from the neighbourhood of Tschina in Turkestan, presented by Dr. A. Strauch, C.M.Z.S., of the Imperial Zoological Museum of St. Petersburg, November 15th.

The species having been established by Dr. Gray upon a single young specimen [1], said to have come from Afghanistan, Dr. Strauch was anxious to have examples of the Central-Asiatic species (which

[1] Gray, Cat. Tort. Brit. Mus. p. 7 (1844), and Cat. Shield Rept. in Brit. Mus. p. 7, tab. i. (1855).

he has excellently described in his 'Chelonologische Studien,' p. 86) compared with the original type. This, through Dr. Günther's kindness I have now been able to do; and I have no doubt of the identity of the species, in which opinion Dr. Günther fully concurs.

Besides the original type, there are two small examples of this Tortoise in the British Museum, obtained in Persia, during the Survey of the Persian Boundary Commission[1]; so that the species would appear to range from Afghanistan through Persia onto the shores of the Caspian and Aral seas and so into Turkestan, whence the present specimens were forwarded to the Imperial Zoological Museum of St. Petersburg by their conservator, von Russow.

Testudo horsfieldi in general appearance much resembles *Testudo græca*, but has only four toes on the front limbs.

2. A small blue Macaw, apparently referable to Spix's Macaw (*Ara spixi*), purchased of the Jardin d'Acclimatation of Paris, November 15, and new to the Society's collection.

This bird seems to agree in every respect with the species as described by Finsch[2], except that the bare space round the eye and lores are black, and not yellow as described by Finsch and as also described and figured by Spix.

I have examined the single specimen of this species in the British Museum (obtained by purchase from a dealer in 1859), and believe it to be the same as our bird. Our specimen, of which I exhibit a figure by Mr. Smit (Plate LXI.) is generally of a bluish grey, the head of a paler light grey, a narrow naked ring round the eye; naked lores and bill black; total length about 18 inches, wing 10, tail 12. The iris is of a pale yellow.

This is the first example of this rare species I have ever seen alive. It is immediately distinguishable from *Ara hyacinthina* and *A. glauca* (of both of which we have living specimens in the collection) by its small size and small bill.

Mr. H. Seebohm exhibited a large series of specimens of the Hooded and Carrion Crows (*Corvus cornix* and *C. corone*) and of the intermediate forms between these species, and made remarks on their geographical range and on the origin of the hybrids.

Col. Irby, F.Z.S., exhibited and made remarks on some nests, eggs, and young of *Cypselus pallidus* taken at Gibraltar.

Mr. Howard Saunders exhibited and made remarks on some Indian eggs, especially those of *Sterna bergii* and *Larus hemprichii*, on behalf of Capt. Butler, H.M. 83rd Regiment. These specimens had been taken on the island of Astola, on the Mekran coast.

Dr. F. Day, F.Z.S., exhibited and made remarks on three jaws of Indian Sharks—one belonging to the genus *Galeocerdo*, and two belonging to the genus *Carcharias*,—and pointed out that one of the

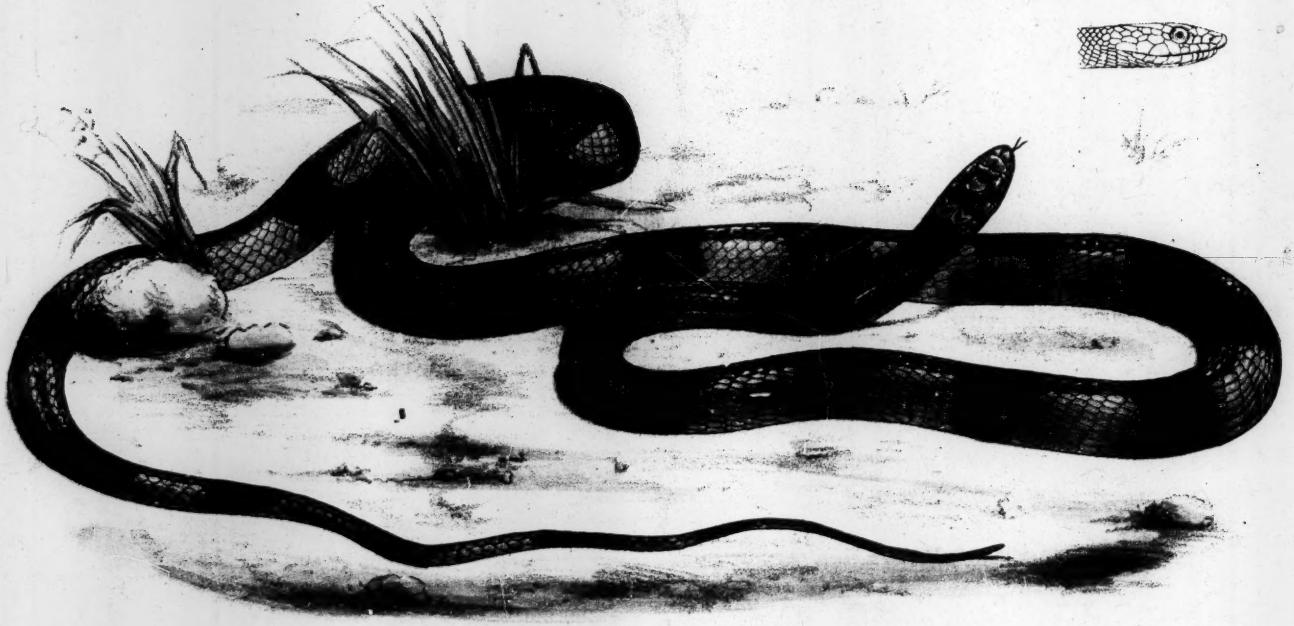
[1] See Blanford's 'Zoology of Persia,' p. 308.
[2] *Sittace spixi*, Finsch, Papag. vol. i. p. 393.



J.Smit lith.

Hanhart imp

ARA SPIXI.



R. Mintern del.

ZAMENIS ELEGANTISSIMUS.

Mintern Bros. imp.

latter had the teeth of *Odontaspis*, whereas the other had the teeth in the upper jaw furnished with cross serrations, approaching in this respect *Galeocerdo*, while the teeth in the lower jaw were more like those of *Odontaspis*.

Mr. Sclater read a letter with enclosures from Mr. R. Davenport, of 124 Georgiana Street, Bury, whereby it appeared that there could be no doubt of the specimen of the Black-throated Wheatear (*Saxicola stapazina*) exhibited at the last meeting having been obtained in Lancashire, as there stated[1]. The bird was shot by Mr. David Page, of 103 Spring Street, Bury, on or about the 8th May, 1875, whilst sitting on the ridge of the outbuildings belonging to the Bury Angling Association near the reservoir. It was taken in the flesh to Mr. Wright Johnson, of Prestwick, to be mounted. Mr. Johnson had ascertained the sex by dissection to be male.

The Secretary called attention to the error that had accidentally taken place in reference to the Collection of Butterflies from Billiton, on which Messrs. Salvin and Godman had reported in the last number of the Society's 'Proceedings' (*antea*, p. 637). The collection had been made and forwarded to England by Hr. J. G. F. Riedel, of Koepang, Resident of Timor and its dependencies.

The following papers were read:—

1. On Reptiles from Midian collected by Major Burton. By Dr. Albert Günther, F.R.S., F.Z.S.

[Received October 31, 1878.]

(Plate LXII.)

Major Burton has kindly presented to the Trustees of the British Museum the zoological specimens collected by him in Midian[2]. The reptiles are five in number, viz. *Gongylus ocellatus*, *Zamenis cliffordii*, *Zamenis elegantissimus* (sp. n.), *Echis carinata*, and *Echis colorata* (sp. n.),—all of which are characteristic of the Circum-mediterranean fauna. A toad proved to be the common *Bufo vulgaris*.

Major Burton does not seem to have had the means of preserving any mammals and birds; and it is to be hoped that travellers who may succeed him in the exploration of this interesting country will be more fortunate in this respect, as, at present, we are entirely ignorant of this part of the Midianitish fauna.

Zamenis elegantissimus. (Plate LXII.)

The body is moderately slender, head rather narrow, eye of moderate size. Rostral shield convex, reaching the upper surface of the head. The scutes of the upper surface of the head are not

[1] Above p. 881.

[2] See Burton's 'Gold-mines of Midian,' London, C. Kegan Paul & Co., 1878.

subdivided: anterior frontals much smaller than the posterior; vertical large, broad in front, with the lateral margins concave; occipitals rounded behind. Loreal nearly square; three anteoculars, the upper of which is large, concave, extending onto the vertical shield; the two lower are small, and may be regarded as detached portions of the fourth upper labial. Two postoculars; eight upper labials, of which the fifth enters the orbit. Temporals scale-like, 2+3+3, the lower of the anterior pair being larger than the upper. The scales smooth, in 19 rows. Ventrals 197; anal bifid; subcaudals 79. Abdomen with a slight ridge on each side.

The ground colour of this most beautiful snake is olive; a bright orange streak begins on the vertical shield and runs along the entire median line of the back and tail. It is interrupted by broad black cross bands, of which the two anterior occupy the crown of the head, twenty-one encircle the trunk, and eight the tail. The bands on the trunk do not reach across the middle of the abdomen; but the rings on the tail are complete.

The length of the entire specimen is 26 inches, that of the tail being $6\frac{1}{2}$. It was found on the mountains east of El Muwayláh.

ZAMENIS CLIFFORDII, Schleg.

A young specimen from the sandy coast-region of Tihamat Midian.

ECHIS CARINATA, Merr.

One specimen from the sandy coast-region.

ECHIS COLORATA.

This specimen approaches the true Vipers in general habit; but the scales on the side are arranged in the same peculiar manner which is characteristic of *Echis*. In the thickest part of the body the scales form about 35 longitudinal series. There are four series of small scales between the eye and the upper labials. Greyish with large pinkish spots on the upperside; they are rounded on the front part of the body, but more irregular and broken up on the posterior. Lower parts whitish, speckled and powdered with greyish.

Ventrals 208; subcaudals 48.

The single example, which is much injured, was caught on Jebel Shárr, at an altitude of 4500 feet above the level of the sea. It is 27 inches long, the thin tail measuring 3 inches only.

2. On a new Species of *Sylvia* from Abyssinia, and on some other Abyssinian Sylvians. By HENRY SEEBOHM, F.Z.S.

[Received November 7, 1878.]

The only species of the genus *Sylvia* obtained by Jesse on the Abyssinian expedition, was the common Whitethroat. This species was also obtained by Blanford; and in addition he records (Geol. and

Zool. of Abyss. p. 379) a single specimen of *Sylvia melanocephala*, Gm., shot at Rairo in Habab. We learn from the personal narrative that Blanford was at Rairo between the 10th and 15th of August. The skin, doubtless obtained between these two dates, is in the British Museum, and appears to me to belong to a hitherto undescribed species, which I propose to call

SYLVIA BLANFORDI.

The general colour of the upper parts is brown, the innermost secondaries, the quills, and the wing-coverts being narrowly margined with brownish white. The cheeks, head, and nape are brownish black. The tail is very dark brown, the outside tail-feathers (which are much abraded) showing traces of having been tipped with white. The general colour of the underparts is white, shading into brown on the sides of the breast, flanks, axillaries, and under tail-coverts. The bastard primary projects ·3 inch beyond the primary-coverts; and the second primary is between the eighth and ninth in length. The bird is moulting some of the primaries between the third and the eighth. Both mandibles of the bill are dark, and the tarsus and feet are dark slate-grey. The wing measures 2·52, and the tail 2·62. The culmen, which is slightly injured, measures about ·51 when perfect.

The only species with which this bird can be confounded are *S. curruca* (Linn.), *S. melanocephala*, Gm., and *S. rubescens*, Blanf. From *S. curruca* it is easily distinguished by its head being brownish black instead of pale slate-grey, and by its tail being longer instead of shorter, than its wing. From *S. melanocephala* it may be distinguished by the length of wing being 2·52, instead of varying from 2·15 to 2·35, and the colour of the tarsus and feet being dark slate-grey instead of brown. Besides being a larger bird with darker feet, it has a larger bastard primary, a shorter second primary, and has less white on the outside tail-feathers. From *S. rubescens* it may be distinguished by its tail being longer, instead of shorter, than the wing, by its feet being dark slate-grey instead of palish brown, and by its larger size, the less amount of white on the outside feathers of its tail, its longer bastard primary, and more rounded wing.

Sylvia blanfordi appears to be quite distinct from any of the birds described by Rüppell in his 'Neue Wirbelth. Abyss.', or by Heuglin in his 'Orn. Nordost-Afrika's,' and also from the types of Hemprich and Ehrenberg, in the Berlin Museum, described by Dresser and Blanford in the Ibis (1874, p. 335).

Another error of identification in Blanford's 'Abyssinia' will be found on page 358. The skin from Senapé in the British Museum, labelled *Ruticilla phœnicura*, Linn., does not belong to that bird, but to the nearly allied species *Ruticilla mesoleuca*, Ehr. I have also examined the *Pratincolæ* from the Abyssinian collection in the British Museum; and Mr. Sharpe has pointed out to me that *Pratincola semitorquata*, Heugl., is undoubtedly the breeding-plumage of *P. albofasciata*, Rüpp., and that Blanford's skins labelled *Pratincola*

pastor, Strickland, are undoubtedly *P. indica*, Blyth. This species, distinguished, amongst other characters, from *P. rubicola* (Linn.), by its pure white unspotted rump, and its almost entirely black axillaries, was first discovered in Europe by Harvie-Brown and myself in the valley of the Petchora; Drs. Finsch and Brehm found it on the Obb; and I brought home several skins from the Yenesay. Although Severtzoff records both species from Turkestan, there can be scarcely any doubt that Pallas's birds from the Irtish and the Tobol belong to the eastern species, which must therefore stand as *Pratincola maura*, Pall. (Reise Russ. Reichs, ii. p. 708).

3. On the Identity of *Horornis fortipes*, Hodgs., *Neornis assimilis*, Gray, *Horeites robustipes*, Swinhoe, *Horeites pallidus*, Brooks, and *Horeites brunnescens*, Hume. By Henry Seebohm, F.Z.S.

[Received November 7, 1878.]

Cettia fortipes (Hodgson).

Salicaria ——?, Hodgson, icon. ined. nos. 900 & 928.
Horornis fortipes, Hodgson, J. A. S. Beng. xiv. p. 584 (1845).
Drymœca brevicaudata, Blyth, J. A. S. Beng. xvi. p. 459 (1847).
Horornis assimilis, Gray, Cat. Mamm. &c. Nepal coll. Hodgson, p. 30, no. 143 (1863, ex Hodgson).
Horeites robustipes, Swinhoe, Ibis, 1866, p. 398.
Neornis assimilis, Gray, Hand-list of Birds, no. 3096 (1869).
Horeites pallidus, Brooks, J. A. S. Beng. xli. p. 78 (1872).
Horeites brunnescens, Hume, Ibis, 1872, p. 109.

An examination of thirty-two skins of *Horornis fortipes*, Hodgson, *H. assimilis*, Gray, *Horeites robustipes*, Swinhoe, and *Horeites pallidus*, Brooks, leads me to the conclusion that they all belong to one species.

They agree in having the general colour of the upper parts russet (not olive) brown, somewhat yellower on the rump. The wings are brown, fringed externally with russet-brown, and margined internally with white. The tail is brown, fringed with russet-brown. An indistinct eyebrow and the underparts are buffish white, shading into ochraceous brown on the flanks, thighs, and under tail-coverts. Axillaries and under wing-coverts pale yellow. Young birds have the underparts yellower. The bill is moderately stout, dark horn-colour above, pale horn-colour below, but darker towards the tip. Rictal bristles slender. The wing is very rounded, the first primary rather more than half the length of the second, and the fifth, sixth, and seventh are nearly equal and longest. The tail consists of ten feathers only, and is rounded, its outside feathers being about 0·45 inch shorter than the longest. The foot and tarsus are robust, pale brown in colour; and the latter is very indistinctly scutellated in front. The length of wing varies in adults from 1·9 to 2·28, the tail being about one-twentieth shorter. The culmen measures about 0·5.

Brooks obtained this species in Cashmere; Mandelli has sent skins from Darjeeling; Hodgson found it in Nepal, and Godwin-Austen in Assam. Swinhoe's type from Formosa seems less remotely situated when we remember that Père David obtained the nearly allied species (*Horeites major* and *H. brunneifrons*) in China, where the species under consideration doubtless also occurs.

I place this species in the genus *Cettia*, because it agrees with the type of that genus in having only ten tail-feathers, somewhat similarly graduated, and because both species have a somewhat similar bill, and a rounded wing, not flat like that of a Thrush, but twisted like a plough-plate to fit the body, evidently adapted less for extended flight than to be out of the way when the bird is creeping through dense foliage. Both species agree in having the feathers of the rump considerably developed, and in laying eggs of a uniform dark-red colour in a cup-shaped nest.

The position of this genus is somewhat intermediate between the *Turdinæ* and the *Timeliinæ*. So far as I can see at present, I feel disposed to restrict the *Turdinæ* to birds with a comparatively flat wing, in which the first primary is almost obsolete, whilst the second is lengthened with the other primaries, forming a long pointed wing, adapted for the extended flight of species whose winter-home may be thousands of miles away from their breeding-stations. This scheme would include the Chats, Thrushes, Redstarts, Warblers, and Accentors in the *Turdinæ*, and leave the short-winged Warblers, such as *Prinia*, *Cisticola*, &c., to take their place along with the Babblers and Bulbuls in the *Timeliinæ*. This latter group of birds is characterized by having strong legs and feet, adapted for creeping through tangled foliage, whilst their wings, instead of being flat, are moulded to fit the body of the bird and to occupy as little room as possible. The conformation of the wing is ill-adapted to extended flight. The first primary is large and takes its place naturally beside the shortened second primary, so that it no longer deserves to be called a bastard primary. The other primaries are also short and graduated in length, making a short rounded wing, sufficient for birds whose annual migrations are confined to such narrow limits that they can often look down from the mountains where they breed onto the plain or into the valleys, where they find an abundant supply of winter food.

It must be admitted, however, that in many genera of the *Turdinæ* we find approaches to the *Timeliinæ*, so as to make the two subfamilies not only to come into contact with each other but sometimes to overlap, so that we may have occasionally a turdine species of the *Timeliinæ* more turdine than the most timeliine species of the *Turdinæ*. These little difficulties are very puzzling to the systematic ornithologist; but possibly they may be evidence that his system is a natural one rather than otherwise.

The following list of skins examined will show how impossible it is to draw any distinction in respect of size between the four reputed species which I propose to unite:—

Length of wing.			
in.			
2·28	Sikkim.	G. Austen.	Horornis fortipes.
2·24	Naga hills.	,,	Neornis assimilis ♂.
2·2	Sikkim.	Brooks.	Horornis fortipes.
2·2	Darjeeling.	Hume.	Horeites brunnescens.
2·2	Nepal.	Hodgson.	Neornis assimilis.
2·2	Naga hills.	G. Austen.	,, ♀.
2·18	Shillong.	,,	,,
2·18	Nepal.	Hodgson.	,,
2·15	Darjeeling.	Brooks.	Horeites pallidus.
2·15	Khasa.	G. Austen.	Neornis assimilis.
2·14	Sikkim.	,,	Horornis fortipes.
2·14	Shillong.	,,	Neornis assimilis ♂.
2·14	Cashmere.	Brooks.	Horeites pallidus.
2·13	Shillong.	G. Austen.	Neornis assimilis ♂.
2·13	Darjeeling.	Blyth.	Drymœca brevicaudata.
2·11	Nepal.	Hodgson.	Neornis assimilis.
2·11	,,	,,	,,
2·1	,,	,,	,,
2·1	,,	,,	,,
2·1	Shillong.	G. Austen.	,, ♂.
2·07	Naga hills.	,,	,, ♀.
2·05	Munipur	,,	,,
2·0	Formosa.	Swinhoe.	Horeites robustipes.
2·0	Nepal	Hodgson.	Neornis assimilis, juv.
1·96	,,	,,	,,
1·95	,,	,,	Neornis assimilis.
1·95	Khasi.	G. Austen.	,,
1·9	Formosa.	Swinhoe.	Horeites robustipes.
1·9	Darjeeling.	Brooks.	Horeites pallidus.
1·9	Nepal.	Hodgson.	Neornis assimilis, juv.
1·88	,,	,,	,,
1·88	,,	,,	,,
1·81	,,	,,	,,

4. Description of new Species of Phytophagous Coleoptera from Central and South America. By Martin Jacoby.

[Received November 13, 1878.]

1. Lema suffriani, sp. nov.

Oblong, light testaceous. Head and breast black; elytra striate-punctate, testaceous, a short sutural and submarginal stripe at the base and two small spots, one before, the other behind the middle of each elytron, violaceous black.

Length $2\frac{3}{4}$–$3\frac{1}{2}$ lines.

Head shining black, impunctate, not constricted behind the eyes, the lateral grooves very deep; antennæ nearly as long as half the body, of a uniform light rufous or testaceous colour, only the basal joint stained with piceous; thorax scarcely longer than broad, deeply

constricted behind the middle, smooth, impunctate, testaceous; scutellum subquadrate, black. Elytra strongly and very regularly punctate-striate, the ninth stria entire, the interstices slightly raised towards the apex; a short longitudinal sutural stripe at the base, another of equal length covering the shoulder and pointed posteriorly, where both stripes finish a little before the middle, a small round spot between these stripes at their end, and another spot at a little distance from the apex of each elytron, shining violaceous black. Abdomen and the legs testaceous.

Hab. Volcano of Irazu, Costa Rica.

Collected by Mr. Rogers.

This species bears a close resemblance to *L. bifida*, Oliv., and *L. semisepta*, Lac., in coloration, but is distinguished from the first by the elytra having two spots instead of one, the uniformly coloured antennæ and the smooth thorax, while the same differences distinguish it from the latter species. I have seen about a dozen specimens, all of which agree exactly with each other in having the light-coloured antennæ and legs and the two spots on each elytron.

2. MASTOSTETHUS SALVINI, sp. nov.

Elongate, parallel, testaceous, the sides of the breast and the upper part of the head shining black. Thorax rufous, nitidous. Elytra light testaceous, a large semiquadrate patch from the base to the middle on each, and a broad transverse fascia behind the middle, common to both elytra, black.

Length 4½ lines.

Head distinctly punctured round the eyes, the other part smooth and shining, lower part of face flavous, upper part black; antennæ reaching to the base of the thorax, testaceous, the first to the eighth joint above stained with black, but diminishing towards the apex, and entirely disappearing from the ninth joint. Thorax narrowed from the base to the apex; surface very minutely and widely punctured, impressed near the hinder angles with a distinct fovea; scutellum black. Elytra subdepressed above, narrowed towards the apex, surface strongly but not very closely punctured; pale testaceous, a large spot on each elytron from the base to the middle, narrowed towards the suture, and a transverse fascia (neither of which extends quite to the lateral margin), the latter only separated from the former by a narrow interval, with the posterior margin irregular, black; the apex of the elytra are of the ground-colour to about the same extent as the width of the transverse band. The underside, with the exception of the sides of the breast, the dorsal surface of the four anterior femora, and all the tibiæ, which are black, testaceous; hinder femora and inner side of tibiæ of the same colour, the former with a distinct tooth near the apex.

Hab. Cache, Costa Rica.

Collected by Mr. Rogers.

3. LAMPROSOMA CHAPUISI, sp. nov.

Ovate, convex, dark violaceous; head, lateral and anterior margins

of thorax, apex of the elytra, outside of legs brilliant aureous or copper-coloured. Head distinctly punctured.

Length 2 lines.

Head finely granulose, rather deeply but not closely punctured, bright aureous; first and second joint of the antennæ of the latter colour, the rest black. Thorax with its sides straight, anteriorly much deflexed, the surface very convex and obtusely punctured, much less distinctly visible than the punctures of the head, of an almost black violaceous, with the anterior margin very narrowly and the sides to a greater extent, but diminishing in width towards the base, ornamented with bright metallic reddish-golden colour; the inner margin of this colour at the sides of the thorax is deeply dentate. Elytra very convex near their base, distinctly narrowed towards the apex; each elytron with ten rows of rather coarse and very regularly placed punctures, which scarcely diminish in size towards the apex, the interstices smooth and impunctate; the colour is of the same dark violaceous as that of the thorax; and at the apex of each elytron is an elongate-oval patch of the same metallic colour as the head and the thorax. Underside black, the outer sides of all the legs metallic aureous; tarsi black.

Hab. Costa Rica.

In my collection.

This species is very closely allied to *L. ignicaudatum*, Lac., and *L. coruscum*, Lac.; but differs from the former by the deeply punctured head, and the shape of the golden lateral band of the thorax, while it is distinguished from the latter species by the shape of the elytral spot, the colour of the thorax, and the colour of the legs.

4. LAMPROSOMA INORNATUM, sp. nov.

Ovate-globose, black, shining, above brilliant violaceous blue. Head finely, thorax distinctly punctate; elytra striate-punctate; prosternum smooth.

Length 2½ lines.

Head rather convex, with a small roundish fovea in the middle, widely and finely punctured, violaceous blue, bordered anteriorly with metallic green; antennæ black, the second joint fulvous. Thorax transverse, the anterior angles much deflexed, the sides rounded; posterior margin sinuate on each side, with an obsolete short depression on each side of the median lobe; the surface much more distinctly punctured than the head, and increasing in size towards the base. Elytra very convex, their greatest convexity lying very near the middle viewed sideways, they are gradually narrowed towards the apex; and each elytron has ten rows of rather deep punctures, which diminish slightly towards the apex in size; the colour is a brilliant violaceous blue with a greenish tint. Underside and legs black, shining, finely alutaceous and punctured; prosternum elongate, quadrate, perfectly smooth, with a few rows of short whitish hairs.

Hab. Chiriqui.

In my collection.

Although this species is nearly allied to *L. testudineum*, Lac., a

well as to *L. cyaneum*, Lac., it is from both distinguished by its smooth prosternum, from the former by the punctured head, from the latter by the want of the depression at the head.

5. NODA LEFEVREI, sp. nov.

Broadly ovate, uniformly greenish æneous. Head coarsely, thorax less strongly punctured. Elytra semipunctate-striate, costate near the apex.

Length 1¾ line.

Head strongly and closely punctate, especially between the eyes, where the punctures are of an oblong shape. Eyes very prominent; clypeus also strongly punctured, separated from the face, its anterior margin crescent-shaped; antennæ as long as half the body, the last five joints much thickened, and the terminal one very robust and strongly pointed at the apex, the lower six joints shining greenish æneous above, fulvous below, the rest black and opaque. Thorax very narrowed towards the apex, with the posterior angles acutely produced; surface moderately punctured, the punctures not stronger near the sides than those on the disk, and not extending to the anterior or the posterior margin. Scutellum with a few punctures. Elytra convex, with a very obsolete depression below the base; surface very deeply and regularly punctate-striate near the outer margin, finer and more irregularly towards the suture; the intervals towards the apex raised in longitudinal costæ, of which the third and fourth (counting from the outer margin) are united posteriorly sending off a short costa towards the apex. Underside and legs æneous, extreme apex of the tibiæ and the tarsi darkish rufous.

Hab. Costa Rica (volcano of Irazu); Guatemala.

Closely allied to *Noda semicostata*, Lefèvre; but distinguished by the equal punctuation of the thorax, which, in the former species, is, according to the description, strong and dense at the sides.

6. NODA BALYI, sp. nov.

Broadly ovate, æneous, shining; antennæ, palpi, and legs ferruginous. Elytra punctate-striate, with a short round tubercle on the disk of each elytron.

Length 1½ line.

Head rather deeply but widely punctured, the clypeus not separated from the face; antennæ with the third, fourth, and fifth joints of equal length, entirely ferruginous. Thorax of the same shape as in *N. viridis*, distinctly punctate throughout, greenish bronze-coloured. Elytra convex, a little more strongly punctured than the thorax, the punctures arranged in regular striæ, the intervals scarcely raised except near the lateral margin and the apex, where they are semicostate; the humeral callus prominent; and each elytron is furnished at a little distance before the middle with a short round tubercle, which is placed nearer the lateral margin than the suture; a very shallow transverse depression is also visible in certain lights immediately above this tubercle. Underside greenish black, opaque; legs ferruginous.

Hab. Guatemala.

Collected by Mr. Salvin. Collection Jacoby.

Allied to *N. propinqua*, Lefèvre, but differing in the stronger punctuation of the thorax and the sculpture of the elytra.

7. NODA VIRIDIS, sp. nov.

Broadly ovate, shining metallic-green above, below greenish black, the first six or seven joints of the antennæ and the legs entirely ferruginous.

Length 1¼–1⅓ line.

Head coarsely but widely punctate, the clypeus distinctly separated, also strongly punctured, with the anterior margin emarginate; labrum dark ferruginous or brown; vertex of head with an obsolete longitudinal groove. Antennæ of half the length of the body, very robust, with the exception of the short second joint, gradually thickened towards the apex, the three penultimate joints of nearly equal length and cylindrical, the terminal joint the longest of any, and pointed at the apex; the first six or seven joints ferruginous, the rest black, opaque. Thorax transverse, the anterior margin nearly straight, the posterior one evenly rounded and produced in the middle, the sides nearly parallel at the base, but narrowed towards the apex, all the angles acute; surface shining metallic green with a slight bluish tint, not very closely but rather deeply punctate. Scutellum smooth. Elytra slightly wider at the base than the thorax, very gradually and evenly rounded towards the apex; disk rather convex, without any basal depression; the humeral callus produced and smooth; surface finely punctured a little more strongly near the base, the punctures arranged in rather regular lines, partially running in pairs, and forming one stria near the suture towards the apex. Underside opaque blackish green. Legs and tarsi ferruginous.

Hab. Guatemala.

Collected by Mr. O. Salvin. In my collection.

8. NODA BOUCARDI, sp. nov.

Broadly ovate, above violaceous blue, shining, below greenish black. Tibiæ, tarsi, and base of the antennæ rufous. Elytra geminate-punctate-striate.

Length 1½ line.

Head strongly punctured, especially towards the lower part, shining greenish blue; antennæ with the first six joints light rufous, the rest darker. Thorax of the same shape as *N. lefevrei* of this paper, also equally punctate throughout, the puncturing extending at the same time to all the margins. Elytra not differing in form from the above species, the punctuation on the disk, however, united in pairs, and only the extreme apex distinctly costate. Underside semiopaque, greenish black, all the tibiæ and tarsi bright rufous.

Hab. Valin, Guatemala.

Collected by Mr. Salvin.

Allied to *Noda rufipes*, Lefèv. (Mittheil. Münch. Ent. v. 1878), but differing in the equal punctuation of the thorax, the double rows of punctures of the elytra, and the costate apex of the latter.

9. NODA VIOLACEIPENNIS, sp. nov.

Oblong-ovate, blackish green below, violaceous blue above; thorax moderately punctured, elytra semi-punctate-striate, without costæ. Legs and antennæ greenish-æneous.

Length 2 lines.

Head and clypeus with some widely dispersed deep punctures, the former besides with an obsolete fovea in the middle; antennæ more than half the length of the body, robust, uniformly greenish æneous, with the exception of the two basal joints, which are stained with piceous. Thorax of the same shape as the other species of this paper, but rather finely punctured, the punctures on the disk assuming an oblong shape here and there, while the punctuation near the lateral margins is very obsolete. Elytra more oblong than in the other species, shining violaceous blue, with the punctures stronger than those of the thorax, and rather confusedly placed, only towards the apex more distinctly geminate-punctate-striate; the intervals not raised, only an obtuse tubercle visible near the extreme apex; the suture on each side accompanied by an impressed line, commencing about the middle of the elytra, to the apex. Underside and legs greenish black. Tarsi and claws obscure piceous.

Hab. Guatemala.

My collection. Collected by Mr. Salvin.

10. METAXYONYCHA RUFOLIMBATA, sp. nov.

Oblong, broadly ovate. Head aureous, deeply and closely punctured. Thorax laterally obsoletely tridentate, greenish, coarsely punctured. Elytra punctate-striate, the interstices longitudinally costate, greenish; the sides and the apex broadly rufous-coloured, abdomen flavous.

Length 4½ lines.

Head deeply and closely punctured, with a deep longitudinal middle groove, bright aureous or copper-coloured; antennæ black, the first six joints shining. Thorax transverse, distinctly tridentate at the sides, the disk covered with rather deep punctures in the middle and along the anterior margin; the rest of the surface minutely punctate, of a greenish opaque colour. Scutellum elongate, smooth, purplish. Elytra not much wider at the base than the thorax, rather finely punctate-striate, the interstices broadly costate from the base to the apex, where their ends are joined, of the same green opaque colour as the thorax, the sides (narrowly at the base, gradually widened to the apex, the latter broadly) of a rufous colour. Breast and legs purplish green, abdomen light rufous or flavous.

Hab. Venezuela.

Collection Jacoby.

11. PRIONODERA ELEGANS, sp. nov.

Elongate, dark purplish. Head and thorax irregularly punctured and finely transversely wrinkled, the latter at the sides obsoletely bidenticulate. Elytra longitudinally costate, the intervals punctate-

striate, purplish blue, a large triangular sutural patch from the base to the middle reddish copper-coloured.

Length 4½ lines.

Head and clypeus deeply punctured, with a deep longitudinal groove in the middle, of a greenish semiopaque colour, here and there with a purplish tint; labrum and jaws nearly black; first joint of the antennæ very thick and subcylindrical, the second short and globose, the rest cylindrical, equal in length; the first six joints shining greenish aureous, the rest black, opaque. Thorax subquadrate, slightly broader than long, all the angles acute and produced externally, the sides with a distinct tooth behind and another very obsolete one before the middle; disk irregularly transversely wrinkled, visible only when viewed sideways, and covered with large and small punctures; of a greenish colour, sometimes with purplish patches. Scutellum elongate, finely punctate. Elytra much wider at the base than the thorax, a little widened posteriorly; each elytron with eight longitudinal costæ, the intervals subgeminate-punctate-striate; bluish purple, a large sutural triangular patch, extending from the base to below the middle, of a reddish copper, surrounded by light green colour. Underside and legs dark green, with a purplish hue.

Hab. Columbia.

Two specimens in my collection.

12. CHALCOPHANA SEMIRUFA, sp. nov.

Elongate, subparallel, piceous below. Head, thorax, first six joints of the antennæ, and the legs rufous. Elytra deeply and closely punctate-striate and partly costate, shining bronze-colour, extreme margin and the apex rufous.

Length 3½ lines.

Head deeply punctured, with a median groove, labrum yellowish, apex of mandibles black; antennæ with the first six joints rufous, the rest black. Thorax transverse, the posterior margin round and widened in the middle, the anterior one straight, all the angles produced into a short acute tooth, the surface rather coarsely punctate towards the sides, less so on the disk. Scutellum rufous. Elytra with a more or less distinct oblique depression below the base, closely punctate-striate, the punctures not united in pairs, and regularly placed only towards the suture, the rest confused and irregular; the apex as well as the sides of each elytron furnished with three or four more or less distinct costæ, those at the sides commencing below the humeral callus; the surface of a bronze or metallic green colour, the extreme lateral margins and the apex rufous. Underside dark piceous, as well as the tarsi.

Hab. Costa Rica.

Of the six or seven similarly-coloured described species, the present one will be easily recognized by the colour of the first six joints of the antennæ, which is constant in all the specimens before me, as well as by the strong punctuation of the thorax and the elytra.

13. CHALCOPHANA UNIFORMIS, sp. nov.

Entirely dark rufous, with the exception of the last five joints of the antennæ, the apex of the tibiæ, and the tarsi. Thorax finely, elytra deeply geminate-punctate-striate, and more or less costate.

Length 3–3½ lines.

Head exactly punctured as in *semirufa*, the antennæ also coloured as in that species. Thorax a little more finely punctate. Elytra distinctly and closely punctured, the punctures running together in pairs, the interstices either raised over the whole disk in costæ, or only distinctly visible towards the apex. The underside rufous; extreme apex of tibiæ and the tarsi black.

Hab. Costa Rica.

This species may possibly be only a variety of *C. semirufa*; but the uniform coloration, the punctuation of the elytra approached in pairs distinguish it sufficiently from that species, while the colour of the first six joints of the antennæ will separate it from species in other respects similarly coloured.

14. DORYPHORA BRUNNEIPENNIS, sp. nov.

Broadly ovate, narrowed behind, below black; antennæ with the last two joints yellowish white. Head, thorax, and elytra rufous, opaque.

Length 6 lines.

Head strongly but not closely punctate, brown with a greenish tint; antennæ brownish æneous, last two joints whitish. Thorax with the sides parallel, the anterior angles acute; surface with the same-sized punctures as the head, but closely and uniformly distributed. Scutellum smooth, broadly triangular. Elytra broader at the base than the thorax, very convex at their first third, from there strongly declining to the apex, the latter pointed; surface finely and irregularly punctured and longitudinally aciculate, the intervals finely alutaceous, opaque, of a uniformly rufous colour. Beneath black; mesosternal process robust, long, slightly curved. Legs rufous.

Hab. Columbia.

Collection Jacoby.

15. DORYPHORA FLAVIPENNIS, sp. nov.

Greenish black, shining. Head and thorax strongly punctate. Elytra sparingly irregularly punctured, flavous, a sutural stripe narrowed towards the apex, greenish black.

Length 5⅓ lines.

Head more strongly punctured near the apex than at the vertex; antennæ with the last five joints flattened and widened, the first five joints testaceous, stained with greenish æneous above, the rest fuscous. Thorax more strongly punctured than the head, very coarsely towards the sides, dispersedly on the disk. Scutellum smooth. Elytra rotundate towards the apex, parallel near the base, sparingly and rather finely punctate without order, the intervals finely aciculate; the extreme outer margin has a row of punctures, and is accompanied, at some distance, with another row of double

punctures; the suture has also at its posterior part a deeply impressed line running parallel with it at each side. The elytra are of a light flavous, shining, the entire suture greenish or bluish black, which colour is gradually narrowed towards the apex. Underside and legs black with a bluish tint.

Hab. Columbia.

In colour this species approaches close to *D. limbatipennis*, Stål; but the want of the outer marginal vittæ, together with the roundish shape, will distinguish the species before us from the above insect.

16. DORYPHORA VITTATIPENNIS, sp. nov.

Black. Head and thorax opaque. Elytra strongly semipunctate-striate, black, shining; each elytron with five narrow longitudinal flavous stripes.

Length 6 lines.

Head finely punctate; antennæ black, shining. Thorax deeply and irregular punctured, the intervals partly convex; sides narrowed at the base, from there rounded to the apex. Scutellum smooth, triangular, black. Elytra parallel, convex, deeply punctate, striate near the suture, more irregularly towards the sides; black, shining, each elytron with five narrow flavous vittæ at equal distances from each other, of which the outer one is the broadest, all of which are confluent at the apex and extending to the base. Underside and legs black.

Var. Elytra with only the outer vittæ entire, the sutural one only visible at the posterior third, the other stripes entirely absent or only partially visible near the apex.

Hab. Columbia.

Collected by Mr. Salmon.

17. DORYPHORA POROSA, sp. nov.

Broadly ovate, very convex, piceous below. Head and disk of thorax black; sides of latter testaceous. Elytra deeply foveolate, the intervals irregular transversely reticulate, dark brown.

Length 7 lines.

Head opaque, with a few very minute punctures; antennæ long, scarcely thickened towards the apex, fuscous. Thorax with the anterior and posterior margin parallel in the middle, the anterior angles acute and much produced, the sides much flattened and slightly thickened; disk minutely punctate, of the same colour as the head, the sides light testaceous, impunctate. Scutellum broad, smooth, piceous. Elytra convex at their first third, thence suddenly declining and subdepressed towards the apex, uniformly dark brown; the suture shining, piceous, smooth; surface deeply punctate, striate near the suture, foveolate towards the sides, the intervals raised and connected partially by transverse short costæ, forming a kind of network towards the sides. Femora greenish æneous; tibiæ piceous.

Hab. West Columbia.

Collection Jacoby.

18. DORYPHORA HYBRIDA, sp. nov.

Ovate, black below. Head and thorax greenish black, distinctly punctured. Elytra geminate punctate-striate, testaceous; the suture, the outer margin, and two transversely placed large irregularly shaped spots, one placed before, the other behind the middle, as well as the base narrowly, greenish black.

Length 8 lines.

Antennæ rufous. Thorax not very strongly or closely punctured; the intervals also minutely punctate. Scutellum black. Elytra convex, geminate-punctate-striate, each puncture surrounded by a piceous spot; the extreme base, a spot on the shoulder, the outer margin, the suture (which is widened below the base into a square-shaped spot), and a transverse patch, consisting of two united spots before the middle as well as a similar shaped one (formed by three united spots) behind the middle, greenish black. Underside and legs black.

Hab. Peru.

Collection Jacoby.

The insect before me is so exactly similar in markings to the *Doryphora imperialis* of Stal, that it may be only a variety of that species. The colour, however, instead of being rufous, is greenish black. The elytra, besides having the sutural stripe broader, are also marked with regular rows of small piceous spots which surround the puncturing everywhere; and the underside is shining black.

19. DORYPHORA MILITARIS, sp. nov.

Greenish æneous, shining. Elytra closely punctate-striate, four roundish spots placed transversely at the base, two others behind the middle, with two submarginal longitudinal vittæ from the middle to the apex, light flavous, margined with rufous.

Length 6 lines.

Head closely punctured, dark brownish green, labrum fulvous; antennæ gradually thickened towards the apex, the basal joints shining fulvous, the rest greenish æneous. Thorax closely and deeply punctured towards the sides, much more sparingly punctate on the disk, the intervals also minutely punctured. Scutellum smooth. Elytra moderately convex, closely and rather regularly punctate-striate, the punctures diminishing towards the apex; of a greenish æneous colour; each elytron with two spots near the base, of which one is placed on the shoulder, another near the scutellum, an elongate spot behind the middle near the suture, and a longitudinal stripe near the outer margin, from immediately behind the middle to the apex, flavous, all the markings surrounded by a narrow rufous border. Underside shining greenish black; legs more brownish; mesosternal process slightly curved and pointed.

Hab. Columbia.

My collection.

20. DORYPHORA OCELLATA, sp. nov.

Ovate, very convex, testaceous. Thorax with four piceous spots.

Elytra geminate-punctate-striate, fuscous; two large round spots near the scutellum, four others placed transversely, and the apex broadly flavous, the latter with a small fuscous spot.

Length 5 lines.

Head minutely punctured, flat, with an indistinct piceous mark at the vertex; antennæ testaceous, slightly thickened towards their apex, terminal joint scarcely longer than broad. Thorax narrow, sides rounded in front, anterior angles scarcely produced; above much more strongly (but not closely) punctured than the head, of a rather indistinct testaceous colour; four spots placed transversely on the disk, the middle ones, which are in shape of two short longitudinal vittæ, of a greenish piceous colour. Scutellum testaceous. Elytra slightly broader at the base than the thorax, very convex on the disk, their apex regularly rounded; the surface rather finely punctate-striate, consisting of double rows of punctures, which are more deeply impressed on the disk than at the base or the apex; the flavous patches on the disk of each elytron arranged as follows, viz. one in the middle of the base, two transversely, of which the outer larger one is placed immediately below the shoulder, the inner one on the middle near the suture, the fourth occupying the apex to nearly a third of the length of the elytra, having its inner margin sinuate, and in its interior a small fuscous square spot. Underside and legs testaceous. Mesosternal spine rather short, slightly curved.

Hab. Costa Rica?

My collection.

Closely approaching in colouring to *D. æstuans*, Lin., the species described here is distinguished by its much larger size and by the four spots on the thorax.

21. DORYPHORA DECORATA, sp. nov.

Ovate, convex, testaceous. Head with the base, thorax with two vittæ black. Elytra geminate-punctate-striate, testaceous, with three transverse metallic green fasciæ and a longitudinal vitta between the second and third bands.

Length 5½ lines.

Head minutely punctate, with a shallow transverse depression and an obscure longitudinal groove, testaceous, with an irregular transverse bifurcate patch on the vertex; antennæ longer than the thorax, gradually thickened towards the apex, as well as the palpi, testaceous; apex of mandibulæ black. Thorax with a longitudinal depression parallel with the lateral margins, the latter regularly rounded; surface very sparingly but rather deeply punctate, shining testaceous, with two longitudinal black vittæ from the apex to the base, slightly curved outwards, and connected at the base by a very narrow band. Scutellum impunctate, testaceous. Elytra regularly geminate-punctate-striate near the suture, more confusedly towards the sides; shining testaceous, the suture, an obliquely placed transverse band from the shoulder to the suture a little below the scutellum (with its posterior margin denticulate and connected by a narrow stripe at the lateral

margin anteriorly with another transverse band of a Λ-shaped form, and placed in the middle of the elytra), as well as a short rounded band near the apex (this latter band being also connected with the former one by a short vitta near the lateral margin), shining metallic green; the inflexed margin of the elytra, as well as the underside and the legs, testaceous.

Hab. Costa Rica?

Collection Jacoby.

Allied to *D. vittaticollis*, Stål, but differing in the colour of the head, antennæ, and palpi, and the longitudinal stripe between the second and third bands.

22. SCELIDA BALYI, sp. nov.

Elongate, parallel, testaceous; vertex of head, last six joints of antennæ, and the coxæ black. Elytra metallic green, closely rugose-punctate.

Length 4½ lines.

Head impunctate, with two distinct tubercles between the antennæ, limited behind by a transverse groove, lower part of face with a raised triangular ridge; last joint of maxillary palpi piceous; vertex of head black, shining; lower part and the basal five joints of the antennæ flavous, the latter about three fourths the length of the body, with the three terminal joints slightly curved. Eyes prominent, black. Thorax subquadrate, widened from the apex towards the middle, from there straight to the base, the anterior and posterior margins slightly sinuate in middle; surface entirely impunctate, the disk depressed, flavous, with indistinct irregular blotches of a piceous colour. Scutellum semiovate, dark piceous, with a light-coloured margin. Elytra much wider at the base than the thorax, sides entirely parallel, the surface covered throughout with crowded and rather deep punctures, the intervals of which are finely rugose, of a metallic, moderately shining green colour, which assumes towards the apex and near the suture a purplish hue. Under surface and legs flavous, the base of the coxæ and a spot at the base of the anterior femora piceous or black; the metathorax on each side raised in the shape of a triangular-pointed elevation.

This species is the second one belonging to this genus, the first of which was published in diagnosis by Mr. Chapuis in his eleventh volume of the 'Genera of Coleoptera.' From this species it is sufficiently distinguished by its smaller size, the black vertex of the head, together with the spots on the coxæ of the legs, and by the peculiar shape of the metathorax.

23. DIABROTICA WATERHOUSEI, sp. nov.

Elongate, convex, widened behind, flavous. Head, breast, and the extreme base of the elytra pitchy black, the apex of the latter brownish fuscous.

Length 3 lines.

Head shining black, with a distinct fovea between the eyes; antennæ ferruginous, the basal joint flavous. Thorax quadrate,

rather convex, smooth, narrowed towards the base, surface shining, flavous. Scutellum black. Elytra widened towards the apex, rather convex, light flavous, a narrow transverse band at the base undulated at its posterior edge, and extending to the humeral callus, dark fuscous or black; the posterior third of the elytra fuscous brown, surrounded by an indistinct crescent of a darker colour; the rest of the surface covered with minute piceous spots, visible only under a lens. Underside black; abdomen brownish; legs flavous, the hinder tibiæ on their outer side blackish.

Var. Thorax at the anterior margin with a triangular black spot; the apical markings of the elytra obsolete.

Hab. Cache, Costa Rica.

Collected by Mr. Rogers.

24. DIABROTICA JANSONI, sp. nov.

Elongate, convex, widened behind, fulvous. Thorax and elytra closely punctate, a large oval patch near the apex of the latter violaceous blue.

Length $4\frac{1}{2}$–5 lines.

Head with a deep transverse groove, closely punctured, fulvous; antennæ robust, as long as half the length of the body, fuscous, the first joint below fulvous, the fourth joint nearly double the length of the third. Thorax transverse, sides nearly parallel, with three indistinct shallow depressions on the disk, of which two smaller ones are situated on each side and a large one near the posterior margin at its middle; surface distinctly but not very closely punctate, fulvous. Scutellum broad, triangular, its surface very finely alutaceous, and slightly excavated near the base. Elytra more than four times the length of the thorax, much widened towards the apex, and distinctly margined; the surface crowded everywhere with distinct punctures of the same colour as the head and thorax, the whole of the posterior third occupied by a large rounded spot of violaceous blue, which sometimes terminates at some distance from the apex. Underside and the femora testaceous; tibiæ and tarsi fuscous.

Hab. Chontales, Nicaragua. Collected by Mr. Janson.

In my collection.

25. DIABROTICA FUSCOMACULATA, sp. nov.

Testaceous below. Head, thorax, and elytra olive-green, the latter obsoletely costulate, with the base and two spots on each elytron dark fuscous, margined with pale yellow.

Length $2\frac{1}{4}$ lines.

Head impunctate, with a fovea in the middle, shining green; labrum dark brown; antennæ nearly reaching to the end of the body, with the second and third joint very short, the fourth three times as long as the second joint, of an indistinct brownish colour, the first joint pale greenish. Thorax bifoveolate, impunctate, very shining olive-green. Scutellum flavous. Elytra subdepressed,

parallel, closely punctate, with two or three obsolete costæ on the disk, of which the outer one is more distinctly raised, of the same colour as the thorax; a transverse band at the base narrowed towards the suture and extending to the shoulders, a transverse spot in the middle and another at a little distance from the apex of each elytron, dark fuscous; all the spots, as well as the lateral margin at its anterior part, surrounded with yellowish white. Underside pale testaceous, the tibiæ darker, and the femora olive-green.

Var. The middle spot on the elytra absent, as well as the apical one, which is replaced by a yellowish patch.

Hab. Nicaragua, Bogotá. Var. Guatemala.

Collected by Mr. Salvin.

26. DIABROTICA NIGROVITTATA, sp. nov.

Elongate, parallel, black. Thorax bifoveolate. Elytra yellowish white, with the suture and a submarginal longitudinal stripe on each elytron not reaching the apex, black.

Length $2\frac{1}{2}$ lines.

Head very shining black, smooth, with a fovea above the antennæ; the latter of about half the length of the body, entirely black; second and third joints short, equal. Thorax quadrate, narrowed near the base, surface deeply bifoveolate, smooth, very shining black. Scutellum black. Elytra about three times the length of the thorax, with a longitudinal depression below the shoulders and extending a little below the middle; surface very minutely punctured and finely granulose, of a yellowish white, a longitudinal stripe from the base, extending to a little distance from the apex and narrowed at each end, black. Body and the legs shining black.

One specimen from Mexico and another from Guatemala, in my collection.

27. DIABROTICA NOVEMMACULATA, sp. nov.

Elongate, widened behind, flavous. Head and breast black. Elytra finely punctate, flavous, five spots near the base and four near the apex black.

Length 4 lines.

Head black, impunctate, with a fovea and two flat tubercles in front of the antennæ; the latter more than half the length of the body, with the third joint a little longer than the second, and the fourth the longest, of a flavous or ferruginous colour, with the middle joints stained more or less with fuscous. Thorax impunctate, with two shallow depressions on its surface; sides much deflexed and margined, parallel near the base, widened above the middle. Scutellum fuscous. Elytra but little wider at the base than the thorax, gradually widened towards the apex, closely and irregularly punctured, flavous, a triangular spot extending a little below the base at the suture and surrounding the scutellum, an elongate short stripe on each shoulder, a roundish spot between the latter and the sutural one on each elytron, as well as four spots placed

transversely at a little distance from the apex, of which the outer one is elongate, black. Underside and legs flavous, breast black.

Hab. Costa Rica.

Var. The round spots on the elytra replaced by short longitudinal stripes.

28. DIABROTICA COSTATIPENNIS, sp. nov.

Elongate, uniform rufo-flavous. Thorax deeply bifoveolate, shining. Elytra closely rugose, punctate, with five or six elevated more or less distinct longitudinal costæ.

Length 3 lines.

Head perfectly smooth and shining, with a deep fovea above the antennæ; the latter of half the length of the body, the second and third joints very short, the fourth joint more than twice as long as the preceding one, ferruginous, the first three joints shining, the rest opaque. Thorax distinctly margined, narrowed at the base, the surface with two deep foveæ, very shining and impunctate, rufo-flavous. Elytra scarcely widened behind, with a distinct margin which is wider in the middle than on either end; surface closely punctate and finely rugose; each elytron with about six longitudinal raised costæ, which are a little more obsolete near the apex and the base, of a little lighter rufous colour than the thorax. Entire underside and legs flavous, the breast covered with whitish hairs.

Hab. Costa Rica.

29. CEROTOMA NIGROFASCIATA.

Oblong, widened behind, black. Thorax and legs flavous. Elytra dark red, with three broad transverse black bands.

Length 3½ lines.

Head black, vertex punctate; lower part of face coarsely and deeply punctate, with a few flavous hairs; antennæ closely approximate, of half the length of the body, with the first joint very long, the second short, the third longer than the fourth, of a flavous or ferruginous colour. Thorax transverse, the sides much deflexed, the lateral margins much widened before the middle, anterior angles obsolete, posterior ones produced but rounded; the surface rather convex, smooth, indistinctly depressed on the disk, of a light flavous colour. Scutellum black. Elytra much widened towards the apex, deeply and closely punctate, the intervals raised in irregular longitudinal costæ and transverse wrinkles, of a dark red colour; a transverse band common to both elytra at the base, another band slightly arched in the middle not reaching the suture, and a large triangular patch near the apex black; none of these bands reach quite to the lateral margins. Underside black, shining; legs uniformly flavous.

Hab. Costa Rica, Guatemala.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1878.

Jan. 1. 1 Japanese Wild Dog (*Canis familiaris*, var.), ♂. Presented by Harry Pryer, Esq. See P. Z. S. 1878, p. 115.
1 Bristly Ground-Squirrel (*Xerus setosus*), ♂. Purchased.
1 Robben-Island Snake (*Coronella phocarum*). Presented by Messrs. Rice and A. Jamrach.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. F. Wood, Esq.
1 Striped Hyæna (*Hyæna striata*). Presented by Captain F. Cotton.
1 Red-and-Yellow Macaw (*Ara chloroptera*). Presented by Captain King. From Carthagena.
1 Common Sole (*Solea vulgaris*). Presented by G. H. King, Esq.
5. 1 Mexican Deer (*Cervus mexicanus*). Presented by Cyril Graham, Esq. From Venezuela.
7. 1 White-handed Gibbon (*Hylobates lar*), ♀. Presented by W. H. Newman, Esq. From the forests of Laos, Northern Siam.
1 Brown Monkey (*Macacus arctoides*), ♂. Presented by W. H. Newman, Esq.
9. 2 Black Francolins (*Francolinus vulgaris*). Presented by Major Newton Pauli.
1 Chukar Partridge (*Caccabis chukar*). Presented by Major Newton Pauli.
1 Grooved Tortoise (*Testudo sulcata*). Purchased.
2 Rough Terrapins (*Clemmys punctularia*). Purchased.
1 Scorpion Mud-Tortoise (*Cinosternon scorpioides*). Purchased.
10. 4 Common Marmosets (*Hapale jacchus*). Deposited.
14. 1 Arabian Gazelle (*Gazella arabica*), ♂. Presented by Mark Whyley, Esq.
2 Violet Tanagers (*Euphonia violacea*). Purchased.
1 Superb Tanager (*Calliste fastuosa*). Purchased.
1 Tuberculated Lizard (*Iguana tuberculata*). Purchased.
3 Summer Ducks (*Aix sponsa*), 3 ♀. Presented by the Lord Braybrooke, F.Z.S.
15. 1 Stanleyan Chevrotain (*Tragulus stanleyanus*), ♂. Presented by Mrs. Leslie Walker.
1 Javan Chevrotain (*Tragulus javanicus*), ♂. Presented by Mrs. Leslie Walker.

Jan. 16. 2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Purchased.
2 White-bellied Storks (*Abdimia sphenorhyncha*). Purchased.
17. 1 Broad-banded Armadillo (*Xenurus unicinctus*). Purchased.
19. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♀. Presented by Madame Patey.
21. 2 Black Swans (*Cygnus atratus*). Presented by Captain W. H. Eccles.
22. 1 Common Fox (*Canis vulpes*). Presented by Mr. George Fredericks.
2 West-India Rails (*Aramides cayennensis*). Purchased.
23. 1 Hog Deer (*Cervus porcinus*). Born in the Menagerie.
24. 1 Upland Goose (*Bernicla magellanica*), ♀. Purchased. From Chili.
1 Humboldt's Penguin (*Spheniscus humboldti*). Purchased. See P. Z. S. 1878, p. 116.
25. 1 Wood-Owl (*Syrnium aluco*). Presented by J. E. Liardet, Esq.
1 Common Magpie (*Pica caudata*). Presented by G. E. Ladbury, Esq.
1 Jackdaw (*Corvus monedula*). Presented by G. E. Ladbury, Esq.
27. 1 Hoary Snake (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Derbian Opossum (*Didelphys derbiana*). Purchased.
28. 1 Common Puffin (*Fratercula arctica*). Received in exchange. From the Banks of Newfoundland.
29. 1 Brown Bear (*Ursus arctos*). Presented by J. Mason Allen, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by L. E. Lewis, Esq.
1 White-cheeked Capuchin (*Cebus lunatus*). Presented by John Ikin, Esq.
30. 1 Yaguarundi Cat (*Felis yaguarundi*). Purchased.
2 Yarrell's Curassows (*Crax carunculata*), ♂ and ♀. Purchased.
1 Lesser Razor-billed Curassow (*Mitua tomentosa*). Purchased.
2 White-bellied Guans (*Ortalida albiventris*). Purchased.
1 White-fronted Guan (*Penelope jacucaca*). Purchased.
1 Common Trumpeter (*Psophia crepitans*). Purchased.
1 Guira Cuckoo (*Guira piririgua*). Purchased.
1 Sun-Bittern (*Eurypyga helias*). Purchased.
1 Cayenne Lapwing (*Vanellus cayennensis*). Purchased.
1 Double-striped Thicknee (*Œdicnemus bistriatus*). Purchased.
1 Garden's Night-Heron (*Nycticorax gardeni*). Purchased.
1 Maguari Stork (*Ciconia maguari*). Purchased.
1 Black Vulture (*Cathartes atratus*). Purchased.
2 Silky Cowbirds (*Molothrus bonariensis*). Purchased.
1 American Kestrel (*Tinnunculus sparverius*). Purchased.
3 Chilian Pintails (*Dafila spinicauda*). Purchased.
31. 1 Common Badger (*Meles taxus*). Presented by the Lord Saltoun, F.Z.S.
2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by the Rev. S. R. Wilkinson, F.Z.S.
7 Bankiva Jungle-fowls (*Gallus bankiva*). Presented by Mrs. Kendall.

Feb. 4. 1 Azara's Fox (*Canis azaræ*). Purchased.

Feb. 5. 1 Brazilian Tortoise (*Testudo tabulata*). Presented by Captain King.
6. 4 Reeves's Terrapins (*Clemmys reevesi*). Presented by Mr. A. Thomson.
8. 1 Common Swan (*Cygnus olor*). Presented by John Colam, Esq., F.Z.S.
9. 2 Crested Guinea-fowls (*Numida cristata*). Presented by Mrs. Collingwood.
2 Canadian Geese (*Bernicla canadensis*). Presented by Edw. J. Philpot, Esq.
11. 1 Wood-Owl (*Syrnium aluco*). Presented by J. Torpey, Esq.
1 Hey's Partridge (*Caccabis heyi*). Purchased.
12. 2 Macaque Monkeys (*Macacus cynomolgus*). Presented by Lieut.-Colonel Feilden.
13. 2 Chimpanzees (*Troglodytes niger*), ♂ and ♀. Deposited.
1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
1 Garden's Night-Heron (*Nycticorax gardeni*). Presented by Henry Bottrell, Esq.
14. 1 Grivet Monkey (*Cercopithecus griseo-viridis*). Presented by E. H. Lockley, Esq.
15. 1 Collared Peccary (*Dicotyles tajaçu*). Purchased.
1 Black-faced Spider Monkey (*Ateles ater*), ♀. Purchased.
1 Globose Curassow (*Crax globicera*), ♂. Purchased.
17. 1 Chimpanzee (*Troglodytes niger*), ♂. Deposited.
18. 2 Leopards (*Felis pardus*). Purchased. From Persia. See P. Z. S. 1878, p. 289.
20. 2 Red-vented Bulbuls (*Pycnonotus hæmorrhous*). Presented by Colonel A. L. Annesley, F.Z.S.
21. 1 Black-billed Parrakeet (*Palæornis melanorhyncha*). Presented by Mrs. Barthorp. From Muttra, N.W. India.
2 Black-necked Swans (*Cygnus nigricollis*). Received in exchange.
22. 2 Tigers (*Felis tigris*). Born in the Menagerie.
2 Barbary Wild Sheep (*Ovis tragelaphus*), ♂ and ♀. Received in exchange.
23. 2 Black-winged Peafowls (*Pavo nigripennis*), ♀. Presented by the Hon. A. S. G. Canning, F.Z.S.
2 Pale-headed Parrakeets (*Platycercus pallidiceps*). Purchased.
4 Turquoisine Parrakeets (*Euphema pulchella*). Purchased.
24. 1 Black-billed Sheathbill (*Chionis minor*). On approval.
25. 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
26. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.
1 Variegated Sheldrake (*Tadorna variegata*), ♂. Received in exchange.
27. 2 Rock-Sparrows (*Petronia stulta*). Presented by D'Arcy Thompson, Esq.
1 Indian Muntjac (*Cervulus muntjac*), ♂. Born in the Menagerie.
1 Common Snipe (*Gallinago media*). Presented by W. K. Stanley, Esq.
1 Common Adder (*Vipera berus*). Presented by Colonel Irby, F.Z.S.
1 Four-lined Snake (*Coluber quadrilineatus*). Deposited.
28. 2 Brown Coatis (*Nasua nasica*). Presented by the Hon. C. H. Wynn.

Mar. 1. 1 Palm-Squirrel (*Sciurus palmarum*). Presented by Miss Barclay.

Mar. 2. 1 Ocelot (*Felis pardalis*), ♀. Presented by H. B. Whitmarsh, Esq.
1 Yellow Snake (*Chilobothrus inornatus*). Purchased.
2 Black-capped Bitterns (*Butorides atricapilla*). Received in exchange.
1 Red-backed Buzzard (*Buteo erythronotus*). Received in exchange.
1 Yellow-cheeked Amazon (*Chrysotis autumnalis*). Purchased.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by H. Wright, Esq.
1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by G. H. Garrett, Esq.
2 Common Chameleons (*Chamæleon vulgaris*). Presented by G. H. Garrett, Esq.
5. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Captain Pole Carew.
1 Herring-Gull (*Larus argentatus*). Presented by J. W. Capstick, Esq., F.Z.S.
6. 1 Green Lizard (*Lacerta viridis*). Deposited.
2 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Presented by Mrs. Hylton Jolliffe.
7. 2 Sambur Deer (*Cervus aristotelis*), ♂ and ♀. Received in exchange.
1 Isabelline Bear (*Ursus isabellinus*). Received in exchange. See P. Z. S. 1878, p. 378.
1 Javan Adjutant (*Leptoptilus javanicus*). Received in exchange.
1 Siren (*Siren lacertina*). From South Carolina. Received in exchange.
9. 2 Long-legged Buzzards (*Buteo ferox*). Presented by W. J. E. Cartwright, Esq. From India.
1 White-cheeked Bulbul (*Pycnonotus leucogenys*). Purchased.
1 Levaillant's Darter (*Plotus levaillanti*). Purchased. See P. Z. S. 1878, p. 378.
2 Dace (*Leuciscus vulgaris*). Presented by Mr. Parsons.
1 Eel (*Anguilla vulgaris*). Presented by Mr. Parsons.
10. 1 Blue-bonnet Parrakeet (*Psephotus hæmatogaster*). Purchased.
11. 1 Lion (*Felis leo*), ♂. Received in exchange.
1 Three-striped Paradoxure (*Paradoxurus trivirgatus*) Presented by Captain Dalrymple.
3 Black Swans (*Cygnus atratus*). Bred in the Gardens.
13. 1 Zebu (*Bos indicus*), ♀. Born in the Gardens.
14. 2 Common Marmosets (*Hapale jacchus*). Presented by Robert Donaldson, Esq.
1 Green Glossy Starling (*Lamprocolius chalybeus*). Presented by Mrs. Arabin, F.Z.S.
1 White-eared Bulbul (*Pycnonotus leucotis*). Presented by Mrs. Arabin, F.Z.S.
1 Californian Quail (*Callipepla californica*). Presented by Mrs. Arabin, F.Z.S.
1 Common Kestrel (*Tinnunculus alaudarius*). Presented by A. Blumenthal, Esq.
15. 2 Common Badgers (*Meles taxus*). Born in the Gardens.
16. 1 Secretary Vulture (*Serpentarius reptilivorus*). Presented by Messrs. W. Rigg and J. Curtiss.
1 Variegated Sheldrake (*Tadorna variegata*). Purchased.
18. 1 Savigny's Eagle-Owl (*Bubo ascalaphus*). From Bushire, Persian Gulf. Presented by Dr. J. Huntly.

Mar. 19. 2 Darwin's Pucras Pheasants (*Pucrasia darwini*), ♂ and ♀. Purchased.
20. 2 Reindeer (*Rangifer tarandus*). Received in exchange.
1 Jay (*Garrulus glandarius*). Presented by J. Young, Esq.
21. 1 Malayan Bear (*Ursus malayanus*), ♀. Presented by S. Palmer, Esq.
1 Spotted Eagle-Owl (*Bubo maculosus*). Received in exchange.
2 Plantain-Squirrels (*Sciurus plantani*). Received in exchange.
1 Beccari's Cassowary (*Casuarius beccarii*). Received in exchange.
4 Pied Grass-Finches (*Spermestes fringilloides*). Received in exchange.
1 Anaconda (*Eunectes murinus*). Received in exchange.
2 Matamata Terrapins (*Chelys matamata*). Received in exchange. See P. Z. S. 1878, p. 378.
1 One-streaked Hawk (*Melierax monogrammicus*). Received in exchange.
2 Hog Deer (*Cervus porcinus*), 2 ♀. Received in exchange.
1 Egyptian Ichneumon (*Herpestes ichneumon*). Received in exchange.
1 Short-toed Eagle (*Circaëtus gallicus*). Presented by H. M. Upcher, Esq., F.Z.S.
23. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by Mrs. Baxter.
1 Green Monkey (*Cercopithecus callitrichus*). Presented by James Bennet, Esq.
1 Vervet Monkey (*Cercopithecus lalandii*). Presented by W. B. Westwood, Esq.
25. 1 Black-faced Spider Monkey (*Ateles ater*). Deposited.
28. 1 Philippine Paradoxure (*Paradoxurus philippensis*). Received in exchange.
30. 1 Arabian Gazelle (*Gazella arabica*), ♀. Presented by W. Webb, Esq.

Apr. 1. 2 Pudu Deer (*Cervus humilis*), ♂ and ♀. Purchased. From Chili.
1 Naked-eared Deer (*Cervus gymnotis*). Purchased. From Ecuador.
1 Macaque Monkey (*Macacus cynomolgus*). Presented by Francis Pym, Esq.
2 Persian Gazelles (*Gazella subgutturosa*). Presented by R. W. Inglis, Esq.
1 Maned Goose (*Bernicla jubata*), ♂. Purchased.
5. 1 Egyptian Gazelle (*Gazella dorcas*), ♂. Deposited.
1 Vulpine Phalanger (*Phalangista vulpina*). Presented by Capt. T. Ayling.
6. 1 Fraser's Squirrel (*Sciurus stramineus*). Received in exchange. See P. Z. S. 1878, p. 441.
1 Black Sternothere (*Sternothærus niger*). Received in exchange.
7. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Madame Harte.
8. 1 Arabian Baboon (*Cynocephalus hamadryas*), ♀. Presented by Dr. A. P. Woodforde.
10. 2 Chacma Baboons (*Cynocephalus porcarius*). Presented by Capt. W. L. Coke.
1 Short-eared Owl (*Otus brachyotus*). Presented by W. K. Stanley, Esq.

Apr. 11. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Born in the Menagerie.
12. 1 Great Kangaroo (*Macropus giganteus*). Presented by Crawford Caffin, Esq., Lt. R.N.
2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Crawford Caffin, Esq., Lt. R.N.
1 Golden-winged Parrakeet (*Brotogerys chrysoptera*). Received in exchange.
13. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by George Milward, Esq.
1 South-American Rat-Snake (*Spilotes variabilis*). On approval.
15. 1 Stanley Crane (*Tetrapteryx paradisea*). Deposited.
16. 1 Indian Leopard (*Felis pardus*), ♂. Presented by Robert Tubbs, Esq., F.Z.S.
1 Red Deer (*Cervus elaphus*), ♂. Presented by Carrol W. Ansdell, Esq.
1 Common Fox (*Canis vulpes*). Presented by Carrol W. Ansdell, Esq.
2 Spotted Ichneumons (*Herpestes auropunctatus*). Presented by J. McIntosh, Esq.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by W. Ruston, Esq.
18. 1 Suricate (*Suricata zenik*), ♀. Presented by Percy Howard, Esq.
19. 1 Azara's Fox (*Canis azaræ*). Presented by Dr. A. Stradling.
20. 4 Common Foxes (*Canis vulpes*). Born in the Menagerie.
21. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
23. 2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
24. 1 Bennett's Wallaby (*Halmaturus bennetti*). Born in the Menagerie.
1 Hybrid Duck (between *Mareca chiloensis* and *Dafila spinicauda*). Presented by I. Charlton Parr, Esq.
2 Common Carp (*Cyprinus carpio*). Presented by Richard Seyd, Esq., F.Z.S.
25. 1 Black Wallaby (*Halmaturus ualabatus*), ♂. Presented by D. W. Barker, jun., Esq.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by D. W. Barker, jun., Esq.
1 Saffron Finch (*Sycalis flaveola*). Presented by Mrs. Hylton Joliffe.
1 Cariama (*Cariama cristata*). Purchased.
1 Crested Curassow (*Crax alector*). Purchased.
1 Guira Cuckoo (*Guira piririgua*). Purchased.
1 White-faced Tree-Duck (*Dendrocygna autumnalis*). Purchased.
2 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Purchased.
26. 1 Common Seal (*Phoca vitulina*). Purchased.
4 Short-tailed Wallabies (*Halmaturus brachyurus*), 1 ♂ and 3 ♀. Purchased.
1 Long-tailed Cuckoo (*Eudynamis taitensis*). Purchased.
1 Dominican Gull (*Larus dominicanus*). Purchased.
1 Blue-bonnet Parrakeet (*Psephotus hæmatogaster*). Purchased.
1 Stanley Parrakeet (*Platycercus icterotis*). Purchased.
1 Bar-headed Goose (*Anser indicus*). Purchased.
27. 1 African Leopard (*Felis pardus*), ♂. Presented by Mrs. Kirk.

Apr. 27. 1 Beisa Antelope (*Oryx beisa*), ♂. Presented by H.H. the Sultan of Zanzibar. See P. Z. S. 1878, p. 441.
1 Black-crested Eagle (*Spizaëtus occipitalis*). Purchased.
1 Sand-Lizard (*Lacerta agilis*). Presented by Master W. L. Sclater.
1 Smooth Newt (*Triton tæniatus*). Presented by Master B. L. Sclater.
29. 1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.
2 Black Storks (*Ciconia nigra*). Purchased.
1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*). Purchased.
1 Long-nosed Crocodile (*Crocodilus americanus*). Purchased.
30. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by J. M. Neil, Esq.
1 Lion (*Felis leo*). Presented by J. D. Massey, Esq.

May 1. 1 Black Ape (*Cynopithecus niger*). Deposited.
1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
2. 2 Black-faced Spider Monkeys (*Ateles ater*), 2 ♀. Purchased.
1 Common Cassowary (*Casuarius galeatus*). Purchased.
1 Greek Partridge (*Caccabis saxatilis*), white var., ♂. Presented by F. Papillon, Esq. From Beyrout.
1 Golden-winged Woodpecker (*Colaptes auratus*). Purchased.
2 Lesser Birds of Paradise (*Paradisea minor*). Purchased. See P. Z. S. 1878, p. 631.
3. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by G. W. Twining, Esq.
1 Common Cormorant (*Phalacrocorax carbo*). Presented by Lord Braybrooke, F.Z.S.
4 Green Lizards (*Lacerta viridis*). Presented by F. E. Lawder, Esq.
1 Black-eared Marmoset (*Hapale penicillata*). Presented by Walter M. St. Aubyn, Esq.
6. 1 Bonelli's Eagle (*Nisaëtus fasciatus*). Deposited.
1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by J. W. Cossback, Esq.
1 Common Snake (*Tropidonotus natrix*). Presented by Henry Smith, Esq.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Mrs. Tennent.
7. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by W. Mackie, Esq.
8. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Master R. C. Heyworth.
1 Black-backed Jackal (*Canis mesomelas*), ♀. Presented by Richard Seyd, Esq., F.Z.S.
1 Common Badger (*Meles taxus*). Presented by Messrs. J. H. and B. H. Thompson.
1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by John Ritchie, Esq.
9. 1 Slow Loris (*Nycticebus tardigradus*), ♀. Received in exchange.
1 Bonnet-Monkey (*Macacus radiatus*). Presented by R. Bryant, Esq.
1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by Capt. E. J. Howes.
1 Goffin's Cockatoo (*Cacatua goffini*). Presented by Mrs. Pitt.

May 9. 1 Wonga-wonga Pigeon (*Leucosarcia picata*). Bred in the Gardens.
1 Spotted Turtle Dove (*Turtur suratensis*). Bred in the Gardens.
10. 1 Jaguar (*Felis onca*). Presented by Major Wood.
1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by Dr. Byron Whitehead.
9 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.
11. 1 Darwin's Pucras Pheasant (*Purcrasia darwini*). Bred in the Gardens.
3 Water-Ouzels (*Cinclus aquaticus*). Presented by R. J. L. Price, Esq., F.Z.S.
12. 1 Reindeer (*Rangifer tarandus*). Born in the Menagerie.
13. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
14. 1 Wood-Owl (*Syrnium aluco*). Presented by C. B. Wharton, Esq., F.Z.S.
1 Rattlesnake (*Crotalus durissus*). Deposited.
15. 1 Reindeer (*Rangifer tarandus*), ♀. Born in the Menagerie.
1 European Bearded Vulture (*Gypaëtus barbatus*). Deposited.
17. 1 Nilotic Fox (*Canis niloticus*), ♂. Presented by Commr. F. Cotton. From Djeddah, Arabia.
1 Hog-nosed Snake (*Heterodon platyrhinos*). Presented by Dr. Painter, F.Z.S.
1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
4 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Gardens.
20. 1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.
22. 2 Bar-headed Geese (*Anser indicus*), ♂ and ♀. Purchased.
23. 2 Chimpanzees (*Troglodytes niger*), 2 ♂. Deposited.
4 Water-Ouzels (*Cinclus aquaticus*). Presented by R. J. L. Price, Esq., F.Z.S.
1 Variegated Sheldrake (*Tadorna variegata*), ♂. Received in exchange.
2 Great-billed Rheas (*Rhea macrorhyncha*). Received in exchange.
2 Sulphury Tyrants (*Pitangus sulphuratus*). Received in exchange.
2 Geoffroy's Doves (*Peristera geoffroii*). Bred in the Gardens.
7 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.
25. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Henry Willatt, Esq.
1 White-fronted Capuchin (*Cebus albifrons*), ♀. Presented by Dayrell Davies, Esq., R.N.
2 Wild Cats (*Felis catus*). Born in the Menagerie.
3 Wild Boars (*Sus scrofa*). Born in the Menagerie.
1 Yellow-legged Herring-Gull (*Larus leucophæus*). Bred in the Gardens.
1 Hairy Tapir (*Tapirus roulini*), ♂. Received in exchange. See P. Z. S. 1878, p. 631, pl. xxxix.
3 Common Rheas (*Rhea americana*). Presented by Frank Parish, Esq.
27. 4 Temminck's Tragopans (*Ceriornis temminckii*). Bred in the Gardens.
1 Brazilian Caracara (*Polyborus brasiliensis*). Presented by Miss Amslie.

May 29. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. Farmer, Esq.
1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.
30. 1 Geoffroy's Cat (*Felis geoffroii*), ♂. Presented by Ronald Bridgett, Esq.
1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*). Born in the Menagerie.
31. 1 Tamandua Anteater (*Tamandua tetradactyla*). Purchased.

June 3. 8 Common Sticklebacks (*Gasterosteus aculeatus*). Presented by Master G. L. Sclater.
4. 2 Indranee Owls (*Syrnium indranee*). Deposited.
5. 1 White-fronted Amazon (*Chrysotis leucocephala*). Purchased.
6. 1 Mouflon (*Ovis musimon*). Born in the Menagerie.
2 Greater Spotted Woodpeckers (*Picus major*). Presented by J. A. Cooper, Esq.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by N. Partocalis, Esq.
7. 2 Horned Tragopans (*Ceriornis satyra*). Bred in the Gardens.
1 Impeyan Pheasant (*Lophophorus impeyanus*). Bred in the Gardens.
2 Oystercatchers (*Hæmatopus ostralegus*). Purchased.
12 Green Tree-Frogs (*Hyla arborea*). Purchased.
8. 2 Mandrills (*Cynocephalus mormon*). Presented by G. H. Garrett, Esq.
1 Ocellated Monitor (*Monitor ocellatus*). Presented by G. H. Garrett, Esq.
2 Black Rats (*Mus rattus*). Presented by W. H. Hatcher, Esq.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by W. W. Spicer, Esq.
9. 1 Rhesus Monkey (*Macacus erythræus*). Born in the Menagerie.
2 Common Seals (*Phoca vitulina*). Purchased.
10. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by J. C. Witte, Esq.
1 White Ibis (*Ibis alba*). Purchased.
1 Spotted Cavy (*Cœlogenys paca*). Purchased.
1 Ocelot (*Felis pardalis*). Presented by Capt. J. Moir.
1 Black-faced Spider Monkey (*Ateles ater*). Presented by Capt. J. Moir.
1 Common Boa (*Boa constrictor*). Presented by Capt. J. Moir.
1 West-India Rail (*Aramides cayennensis*). Presented by Capt. J. Moir.
1 Black Tortoise (*Testudo carbonaria*). Presented by Capt. J. Moir.
2 Black-crested Cardinals (*Gubernatrix cristatella*). Presented by Mrs. Arabin, F.Z.S.
1 American Thrush (*Turdus migratorius*). Presented by Mrs. Arabin, F.Z.S.
11. 1 Spotted Turtle Dove (*Turtur suratensis*). Bred in the Gardens.
2 Brazilian Teal (*Querquedula brasiliensis*). Bred in the Gardens.
1 Bay Antelope (*Cephalophus dorsalis*), ♀. Purchased.
1 Black Saki (*Pithecia satanas*). Purchased.
12. 1 Chimpanzee (*Troglodytes niger*), ♀. Deposited.

June 13. 1 Himalayan Bear (*Ursus tibetanus*), ♂. Presented by Commander J. S. Murray.
1 Indian Crow (*Corvus splendens*). Presented by Commander J. S. Murray.
6 Herring-Gulls (*Larus argentatus*). Presented by Arthur Clarke, Esq.
14. 1 Rufous Rat-Kangaroo (*Hypsiprymnus rufescens*). Presented by T. Wickenden, Esq.
1 Reeves's Muntjac (*Cervulus reevesi*). Born in the Gardens.
15. 6 Upland Geese (*Bernicla magellanica*). Bred in the Gardens.
17. 1 Indian Gazelle (*Gazella bennetti*) ♂. Presented by Miss A. Statter.
1 Vulpine Phalanger (*Phalangista vulpina*). Presented by E. J. Beagle, Esq.
1 Common Cormorant (*Phalacrocorax carbo*). Presented by W. Thompson, Esq.
18. 2 Cereopsis Geese (*Cereopsis novæ-hollandiæ*), ♂ and ♀. Purchased.
2 Australian Sheldrakes (*Tadorna tadornoides*), ♂ and ♀. Purchased.
4 Smooth Newts (*Triton tæniatus*). Presented by Master B. L. Sclater.
19. 2 Mantchurian Crossoptilons (*Crossoptilon mantchuricum*), ♂ and ♀. Received in exchange.
2 Black-billed Tree-Ducks (*Dendrocygna arcuata*). Received in exchange.
2 Prairie Marmots (*Cynomys ludovicianus*). Presented by Mons. J. W. Cornély, C.M.Z.S.
1 Yellow-billed Sheathbill (*Chionis alba*). Purchased.
1 Barbel (*Lota vulgaris*). Presented by Earl Brownlow, F.Z.S.
20. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Samuel Curtis, Esq.
1 Red-billed Tree-Duck (*Dendrocygna autumnalis*). Presented by R. M. Hyde, Esq.
1 Scarlet Ibis (*Ibis rubra*). Presented by R. M. Hyde, Esq.
21. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by W. H. Gedge, Esq.
1 Hybrid Ass (between *Equus onager* ♂ and *Equus hemippus*), ♀. Born in the Menagerie.
1 Mueller's Parrot (*Tanygnathus muelleri*). Purchased.
1 Talpacoti Ground-Dove (*Chalcopelia talpacoti*). Bred in the Gardens.
22. 2 Argus Pheasants (*Argus giganteus*). Bred in the Gardens.
4 Summer Ducks (*Aix sponsa*). Bred in the Gardens.
4 Chilian Widgeon (*Mareca chiloensis*). Bred in the Gardens.
3 Australian Wild Ducks (*Anas superciliosa*). Bred in the Gardens.
2 Common Cormorants (*Phalacrocorax carbo*). Presented by Edward Banks, Esq.
24. 1 Pine-Marten (*Martes abietum*). Presented by Robert Walters, Esq., F.Z.S.
1 Green-necked Peafowl (*Pavo spicifer*). Bred in the Gardens.
25. 1 Rhesus Monkey (*Macacus erythræus*), ♀. Presented by Mrs. Walcot.
10 Herring-Gulls (*Larus argentatus*). Deposited.
1 Brown Capuchin (*Cebus fatuellus*). Presented by A. Warmington, Esq.

June 25. 1 Daubenton's Curassow (*Crax daubentoni*). Presented by A. Warmington, Esq.
1 Common Boa (*Boa constrictor*). Purchased.
1 Garden's Night-Heron (*Nycticorax gardeni*). Purchased.
26. 1 Japanese Wolf (*Canis hodophylax*), ♀. Presented by H. Heywood Jones, Esq., F.Z.S. See P. Z. S. 1878, p. 788.
1 Common Seal (*Phoca vitulina*). Deposited.
6 Goldfinches (*Carduelis elegans*). Presented by C. F. Johnson, Esq.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by C. F. Johnson, Esq.
4 Geoffroy's Doves (*Peristera geoffroi*). Bred in the Gardens.
4 Cunningham's Skinks (*Egernia cunninghami*). Presented by J. G. Pearson, Esq.
27. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Alex. C. Forbes, Esq.
28. 1 Short-tailed Capromys (*Capromys brachyurus*). Presented by the Hon. H. J. Burford Hancock.
1 Indian Antelope (*Antilope cervicapra*), ♀. Received in exchange.
1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Presented by Philip Saville, Esq.
29. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♂. Presented by Capt. C. F. Filliter.
1 Common Marmoset (*Hapale jacchus*), ♀. Presented by Edward Clayton, Esq.
1 Pinche Monkey (*Midas œdipus*), ♂. Presented by Edward Clayton, Esq.
30. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Mrs. George Yeomans.

July 1. 1 Reeves's Muntjac (*Cervulus reevesi*), ♀. Born in the Menagerie.
2. 2 Black Wallabies (*Halmaturus ualabatus*), ♂ and ♀. Received in exchange.
1 Australian Monitor (*Monitor gouldi*). Purchased.
3. 6 Amherst Pheasants (*Thaumalea amherstiæ*). Bred in the Gardens.
1 Fork-tailed Jungle-fowl (*Gallus furcatus*). Bred in the Gardens.
1 Demerarar Cock of the Rock (*Rupicola crocea*). Purchased.
1 Prince Albert's Curassow (*Crax alberti*), ♂. Purchasd.
2 Black-faced Spider Monkeys (*Ateles ater*), ♂ and ♀. Purchased.
4. 1 Persian Gazelle (*Gazella subgutturosa*), ♂. Presented by Col. Nixon.
1 Goliath Heron (*Ardea goliath*). Presented by Col. Nixon.
1 Spotted Ichneumon (*Herpestes auropunctatus*). Presented by Mrs. Payne.
5. 1 King Parrakeet (*Aprosmictus scapulatus*). Presented by Ebenezer Carr, Esq.
6. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Edward Wright, Esq.
2 Red-faced Weaver-birds (*Foudia erythrops*). Presented by Miss M. Jackson.
1 Chestnut-bellied Finch (*Munia rubro-nigra*). Presented by Miss M. Jackson.

July 6. 2 Common Redpoles (*Linota rufescens*). Presented by Miss M. Jackson.
2 Canary Finches (*Serinus canarius*). Presented by Miss M. Jackson.
2 Æsculapian Snakes (*Coluber æsculapii*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
2 Lacertine Snakes (*Cœlopeltis lacertina*). Presented by Lord Lilford, F.Z.S. From Tunis.
1 Horse-shoe Snake (*Zamenis hippocrepis*). Presented by Lord Lilford, F.Z.S. From Tripoli.
1 Leopardine Snake (*Coluber leopardinus*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
1 Vivacious Snake (*Tachymenis vivax*). Presented by Lord Lilford, F.Z.S. From Montenegro.
1 Dark-green Snake (*Zamenis atrovirens*, var. *carbonarius*). Presented by Lord Lilford F.Z.S. From Italy.
1 Four-rayed Snake (*Elaphis quaterradiatus*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
8. 4 Vulturine Guinea-fowls (*Numida vulturina*). Deposited.
9. 1 Hybrid Fallow Deer between *Dama mesopotamica* ♂ and *Dama vulgaris* ♀. Born in the Menagerie.
1 Hairy Tree-Porcupine (*Sphingurus prehensilis*). Born in the Menagerie.
2 Water-Vipers (*Cenchris piscivorus*). Purchased.
5 Seven-banded Snakes (*Tropidonotus leberis*). Purchased.
4 Red-headed Buntings (*Euspiza luteola*). Purchased.
4 Green-winged Doves (*Chalcophaps indica*). Purchased.
1 Plantain-Squirrel (*Sciurus plantani*). Purchased.
1 Water-Chevrotain (*Hyomoschus aquaticus*). Purchased.
1 Electric Silurus (*Malapterurus beninensis*). Purchased.
10. 1 Beatrix Antelope (*Oryx beatrix*), ♂. Presented by Commander Burke, S.S. 'Arcot.' From Arabia. See P.Z.S. 1878, p. 789.
1 Barn-Owl (*Strix flammea*). Presented by Commander Wyatt, S.S. 'Deccan.' From Mesopotamia.
3 Bullfinches (*Pyrrhula rubicilla*). Presented by Miss A. Sargeant.
11. 4 Paradise Whydah-birds (*Vidua paradisea*). Presented by Archibald Brown, Esq.
1 Pin-tailed Whydah-bird (*Vidua principalis*). Presented by Archibald Brown, Esq.
3 Grenadier Weaver-birds (*Euplectes oryx*). Presented by Archibald Brown, Esq.
2 Hooded Finches (*Spermestes cucullatus*). Presented by Archibald Brown, Esq.
2 Crested Porcupines (*Hystrix cristata*). Presented by Dr. G. S. Badger.
1 Banded Ichneumon (*Herpestes fasciatus*). Presented by Dr. G. S. Badger.
1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by Capt. Henderson.
1 Green Tree-Frog (*Hyla arborea*). Presented by J. Greenwood, Esq.
14. 1 Green Tree-Frog (*Hyla arborea*). Presented by Lord Arthur Russell, F.Z.S.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Enoch.

July 15. 1 Golden-headed Marmoset (*Midas chrysomelas*), ♂. Purchased. From Para.
1 Horrid Rattlesnake (*Crotalus horridus*). Purchased. From Bahia.
1 Thick-billed Tanager (*Euphonia crassirostris*), ♀. Purchased. From Para.
3 Alligator Terrapins (*Chelydra serpentina*). Presented by J. H. Thompson, Esq., C.M.Z.S.
1 Eland (*Oreas canna*), ♂. Born in the Menagerie.
16. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by Miss Davis.
2 Cape Zorillas (*Ictonyx zorilla*). Presented by Mrs. J. J. Monteiro.
1 Argus Pheasant (*Argus giganteus*). Bred in the Gardens.
5 Amherst Pheasants (*Thaumalea amherstiæ*). Bred in the Gardens.
19. 1 Common Cuckoo (*Cuculus canorus*). Presented by G. D. Careless, Esq.
2 Smooth Snakes (*Coronella lævis*). Purchased. From Hampshire.
20. 1 Black-necked Swan (*Cygnus nigricollis*). Bred in the Gardens.
22. 1 Nightingale (*Daulias luscinia*). Presented by — Gee, Esq.
23. 1 Wood-Owl (*Syrnium aluco*). Presented by H. T. Wharton, Esq., F.Z.S.
1 Red-and-blue Macaw (*Ara macao*). Presented by H. T. Wharton, Esq., F.Z.S.
1 Blue-and-yellow Macaw (*Ara ararauna*). Presented by H. T. Wharton, Esq., F.Z.S.
1 Common Gull (*Larus canus*). Presented by F. Lancelott, Esq.
25. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Presented by Dr. Adcock.
2 American Flying Squirrels (*Sciuropterus volucella*), ♂ and ♀. Received in exchange.
1 Coati (*Nasua nasica*). Received in exchange.
27. 1 Orang-outang (*Simia satyrus*), ♀. Received in exchange. See P. Z. S. 1878, p. 789.
1 Green-winged Dove (*Chalcophaps indica*). Presented by Capt. W. Otho N. Shaw.
1 Burrowing Owl (*Speotyto cunicularia*). Presented by Geo. E. P. Nixon, Esq., M.D.
6 Common Guillemots (*Uria troïle*). Presented by Sir Hew Dalrymple, Bart.
29. 1 Greater Sulphur-Crested Cockatoo (*Cacatua galerita*). Presented by Mrs. A. A. Hole.
1 Ocelot (*Felis pardalis*). Purchased.
1 Black Vulture (*Cathartes atratus*). Purchased.
2 Chilian Sea-Eagles (*Geranoaëtus melanoleucus*). Purchased.
1 Brazilian Caracara (*Polyborus brasiliensis*). Purchased.
2 Rufous Tinamous (*Rhynchotus rufescens*). Purchased.
9 Spotted Tinamous (*Nothura maculosa*). Purchased.
1 Razor-billed Curassow (*Mitua tuberosa*). Purchased.
31. 1 Mexican Deer (*Cervus mexicanus*), ♀. Presented by A. Scrutton, Esq.
1 Common Fox (*Canis vulpes*). Presented by Athelston Riley, Esq.

July 31. 1 Brown Coati (*Nasua nasica*), ♂. Deposited.
4 Indian Rat-Snakes (*Ptyas mucosa*). Received in exchange.
3 Long-snouted Snakes (*Passerita nycterizans*). Received in exchange.
4 Long-banded Snakes (*Tropidonotus vittatus*). Received in exchange.

Aug. 1. 1 Slow Loris (*Nycticebus tardigradus*) ♂. Presented by Theodore Hance, Esq.
3 Common Cranes (*Grus cinerea*). Presented by Theodore Hance, Esq. From Chinkiang China.
1 Copper-head Snake (*Cenchris contortrix*). Presented by Dr. F. Painter, F.Z.S.
2. 3 Great Bustards (*Otis tarda*), 1 ♂ and 2 ♀. Presented by Lord Lilford, F.Z.S.
1 Tiger Bittern (*Tigrisoma brasiliense*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
1 Passerine Owl (*Glaucidium passerinum*). Presented by W. E. Tait, Esq., C.M.Z.S.
1 Spanish Blue Magpie (*Cyanopolius cooki*). Presented by Lord Lilford, F.Z.S. See P. Z. S. 1878, p. 789.
1 Caspian Terrapin (*Clemmys caspica*). Presented by T. Wilson, Esq.
2 Argus Pheasants (*Argus giganteus*). Bred in the Gardens.
3. 2 Beisa Antelopes (*Oryx beisa*), ♂ and ♀. Presented by Capt. F. M. Hunter, B.C.S.
1 Bacha Eagle (*Spilornis bacha*). Presented by J. S. Jameson, Esq. From Labuan, N.W. Borneo.
4. 1 Axis Deer (*Cervus axis*), ♀. Born in the Menagerie.
5. 2 European Lynxes (*Felis lynx*), ♂ and ♀. Presented by Major Chadwick. From Norway.
1 Hobby (*Hypotriorchis subbuteo*). Presented by W. H. Scratton, Esq.
2 Common Kingfishers (*Alcedo ispida*). Purchased.
1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Gardens.
6. 1 Common Boa (*Boa constrictor*). Presented by Arthur Stradling, Esq.
1 Coati (*Nasua nasica*). Received in exchange.
3 Bluish Finches (*Spermorphila cærulescens*). Deposited.
1 Thick-billed Seed-Finch (*Oryzoborus crassirostris*). Deposited.
1 Red-and-blue Macaw (*Ara macao*). Deposited.
1 Yellow Snake (*Chilobothrus inornatus*). On approval.
7. 1 Weeper Capuchin (*Cebus capucinus*). Deposited.
1 Black-crested Cardinal (*Gubernatrix cristatella*). Bred in the Gardens.
2 Talpacoti Ground-Doves (*Chamæpelia talpacoti*). Bred in the Gardens.
1 Solitary Thrush (*Monticola cyanus*). Presented by W. Verner, Esq.
8. 1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
9. 1 Black Rat (*Mus rattus*). Presented by R. Morton Middleton, Esq.
7 Greek Land-Tortoises (*Testudo græca*). Deposited.
12. 3 Guinea-Pigs (*Cavia caprera*). Presented by Mr. J. Gould.
13. 1 Lion (*Felis leo*), ♂. Presented by W. H. Wylde, Esq.
1 Patas Monkey (*Cercopithecus ruber*). Presented by W. H. Wylde, Esq.

Aug. 13. 2 Common Buzzards (*Buteo vulgaris*). Presented by Valentine Marks, Esq.
2 Herring-Gulls (*Larus argentatus*). Presented by Thomas Landseer, Esq.
1 Crested Ground-Parakeet (*Calopsitta novæ-hollandiæ*). Presented by Mrs. Parker.
2 Barbary Apes (*Macacus inuus*). Deposited.
1 Bladder-nosed Seal (*Cystophora cristata*). Purchased.
14. 1 Common Paradoxure (*Paradoxurus typus*). Presented by Edwin Etty Sass, Esq.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
2 Beautiful Parrakeets (*Psephotus pulcherrimus*). Deposited.
17. 1 Many-zoned Hawk (*Melierax polyzonus*). Presented by C. H. Fisher, Esq. From Mogador.
6 Common Kingfishers (*Alcedo ispida*). Purchased.
13 Greek Land-Tortoises (*Testudo græca*). Deposited.
19. 2 Saffron Finches (*Sycalis flaveola*). Bred in the Gardens.
21. 1 Prairie-Wolf (*Canis latrans*). Presented by Prof. C. M. Vincent, F.G.S., F.R.G.S. From the Rocky Mountains. See P. Z. S. 1878, p. 789.
22. 1 Common Jackal (*Canis aureus*), ♂. Presented by Mr. James Smith.
1 Spotted Ichneumon (*Herpestes auropunctatus*), ♀. Presented by Mr. W. Pyne.
23. 1 Bronze Fruit-Pigeon (*Carpophaga ænea*). Presented by Mr. A. H. Jamrach.
24. 1 White-eared Bulbul (*Pycnonotus leucotis*). Presented by J. W. Wooler, Esq.
26. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Capt. Clarke.
11 Spinose Lizards (*Agama colonorum*). Received in exchange.
1 Cape Bucephalus (*Bucephalus capensis*). Received in exchange.
1 Smooth-bellied Snake (*Homalosoma lutrix*). Received in exchange.
1 Crossed Snake (*Psammophis crucifer*). Received in exchange.
27. 1 Common Marmoset (*Hapale jacchus*). Deposited.
28. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
30. 1 Common Crow (*Corvus cornix*). Presented by F. Sydney B. Brough, Esq.
3 Hybrid Snakes (between *Chilobothrus inornatus* ♂ and *Epicrates angulifer* ♀). Born in the Menagerie. See P. Z. S. 1878, p. 789.
31. 1 White-lipped Peccary (*Dicotyles labiatus*). Purchased.
1 Golden Agouti (*Dasyprocta aguti*). Presented by Geo. Hammond Hawtayne, Esq., C.M.Z.S.
1 Bahama Duck (*Dafila bahamensis*). Bred in the Gardens.

Sept. 1. 1 Red Deer (*Cervus elaphus*). Born in the Menagerie.
2. 1 Caspian Ouaran (*Psammosaurus caspicus*). Presented by F. A. Floyer, Esq., F.Z.S. From Khan Yunis, Egypto-Syrian frontier.
4. 1 Turquoisine Parrakeet (*Euphema pulchella*). Bred in the Gardens.

Sept. 4. 1 Goffin's Cockatoo (*Cacatua goffini*). Deposited by F. A. Rogers, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. Presented by Capt. Benson.
5. 1 Hybrid Kaleege, ♂. Presented by A. F. Wiener, Esq.
2 Tayras (*Galictis barbara*). Born in the Menagerie.
6. 1 Banded Ichneumon (*Herpestes fasciatus*), ♂. Presented by the Rev. H. F. B. Lawrence.
1 Japanese Warbler (*Cettia cantans*). Deposited by E. L. Hyde, Esq.
9. 1 Banded Ichneumon (*Herpestes fasciatus*), ♀. Presented by F. T. Blackley, Esq.
10. 2 Vinaceous Turtle Doves (*Turtur vinaceus*). Presented by Miss Harris.
1 Greek Land-Tortoise (*Testudo græca*). Presented by Miss Harris.
12. 1 Common Adder (*Vipera berus*). Presented by the Viscount Mandeville.
14. 1 Spotted Turtle Dove (*Turtur aurita*). Bred in the Gardens.
16. 1 Oriental Eagle-Owl (*Bubo orientalis*). Presented by Charles Fowler, Esq. From Karennee, Siam. See P. Z. S. 1878, p. 790.
1 Passerine Owl (*Glaucidium passerinum*). Presented by Albert Momber, Esq.
17. 1 Common Adder (*Vipera berus*). Presented by F. Buckland, Esq.
18. 2 Prairie-Marmots (*Cynomys ludovicianus*). Presented by Wilfred G. Marshall, Esq.
2 Leconte's Rattlesnakes (*Crotalus lecontii*). Presented by Wilfred G. Marshall, Esq. From Colorado.
19. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Emily Palmer.
2 Ostriches (*Struthio camelus*), ♂ and ♀. Presented by the Hon. H. C. Vivian, H.B.M. Consul General, Cairo. See P. Z. S. 1878, p. 790.
2 Secretary Vultures (*Serpentarius reptilivorus*). Presented by C. Rivers Wilson, Esq., C.B.
20. 2 Egyptian Gazelles (*Gazella dorcas*), ♂ and ♀. Presented by Thos. Moss, Esq.
3 Reddish Finches (*Spermophila nigro-aurantia*). Presented by R. C. Batterbee, Esq.
1 Lineated Finch (*Spermophila lineata*). Presented by R. C. Batterbee, Esq.
1 Guttural Finch (*Spermophila gutturalis*). Presented by R. C. Batterbee, Esq.
1 Tropical Seed-Finch (*Oryzoborus torridus*). Presented by R. C. Batterbee, Esq
1 Plumbeous Finch (*Spermophila plumbea*). Presented by R. C. Batterbee, Esq.
3 Rufous Tinamous (*Rhynchotus rufescens*). Presented by J. A. Iliffe, Esq.
1 Leonine Monkey (*Macacus leoninus*), ♂. Deposited.
1 Purple-faced Monkey (*Semnopithecus leucoprymnus*). Purchased.
1 Molucca Deer (*Cervus moluccensis*), ♂. Born in the Menagerie.
21. 1 Mocking Bird (*Mimus polyglottus*). Deposited.
1 Common Hangnest (*Icterus vulgaris*). Deposited.

Sept. 22. 2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by A. H. Cocks, Esq., F.Z.S.
23. 2 White-crested Touracous (*Corythaix albocristata*). Presented by W. Wormald, Esq.
25. 1 Bonnet-Monkey (*Macacus radiatus*). Presented by Frederick Carter, Esq.
1 Chestnut-backed Weaver-bird (*Hyphantornis castaneofusca*). Deposited.
4 Rufous-necked Weaver-birds (*Hyphantornis textor*). Deposited.
2 Grenadier Weaver-birds (*Euplectes oryx*). Deposited.
1 Barbary Turtledove (*Turtur risorius*). Deposited.
1 Vinaceous Turtledove (*Turtur vinaceus*). Deposited.
1 Turquoisine Parrakeet (*Euphema pulchella*). Deposited.
2 Undulated Grass-Parrakeets (*Melopsittacus undulata*). Deposited.
7 Crested Ground-Parrakeets (*Calopsitta novæ-hollandiæ*). Deposited.
26. 1 Tabuan Parrakeet (*Pyrrhulopsis tabuensis*). Purchased.
1 Masked Parrakeet (*Pyrrhulopsis personata*). Purchased.
2 Barbel (*Barbus vulgaris*). Presented by G. H. Jones, Esq., F.Z.S.
8 Mocassin Snakes (*Tropidonotus fasciatus*). Born in the Menagerie.
27. 1 Green Turtle (*Chelone viridis*). Presented by Capt. J. Smith.
28. 1 Yellow Wagtail (*Motacilla flava*). Purchased.
29. 1 Black-faced Spider Monkey (*Ateles ater*). Presented by W. C. Kenny, Esq.
30. 1 Variable Squirrel (*Sciurus variabilis*). Purchased.

Oct. 1. 1 Common Fox (*Canis vulpes*), ♂. Presented by F. B. Toogood, Esq.
2. 1 Mona Monkey (*Cercopithecus mona*), ♂. Presented by the Rev. W. N. Ripley.
1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Rev. E. L. Marrett.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.
1 Anubis Baboon (*Cynocephalus anubis*). Deposited.
1 Kinkajou (*Cercoleptes caudivolvulus*). Deposited.
1 Sumatran Rhinoceros (*Rhinoceros sumatrensis*), ♀. Deposited. See P. Z. S. 1878, p. 790.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by D. L. Broughton, Esq.
5. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Deposited.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Received in exchange.
1 Red-beaked Weaver-bird (*Quelea sanguinirostris*). Presented by W. H. Simmonds, Esq.
1 Passerine Owl (*Glaucidium passerinum*). Presented by Miss Turner.
6. 1 Red-crested Touracou (*Corythaix erythrolophus*). Presented by J. Colman, Esq., C.M.Z.S.
1 Cape Zorilla (*Ictonyx zorilla*). Presented by J. Colman, Esq.
7. 1 Red-sided Eclectus (*Eclectus polychlorus*), ♀. Purchased.
1 Brown Mynah (*Acridotheres fuscus*). Presented by Capt. J. Murray.

Oct. 7. 1 Pied Mynah (*Sturnopastor contra*). Presented by Capt. J. Murray.
1 Indranee Owl (*Syrnium indranee*). Presented by Capt. J. Murray.
1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
9. 4 Egyptian Geese (*Chenalopex ægyptiaca*). Presented by Mr. Justice Denyssen, of the Cape colony.
2 Leopard Tortoises (*Testudo pardalis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1878, p. 790.
1 Collared Peccary (*Dicotyles tajacu*). Presented by J. Lloyd, Esq.
10. 1 Common Otter (*Lutra vulgaris*). Presented by W. H. Baylis, Esq.
4 Chinese Turtledoves (*Turtur chinensis*). Purchased.
11. 1 Cross Fox (*Canis fulvus*). Presented by Wilfred G. Marshall, Esq. From Colorado.
13. 1 Hybrid Mandrill Monkey (between *Cynocephalus mormon* ♀, and *Macacus cynomolgus* ♂, large variety). Born in the Menagerie. See P. Z. S. 1878, p. 791.
1 Indian Muntjac (*Cervulus muntjac*), ♀. Born in the Menagerie.
1 Philantomba Antelope (*Cephalophus maxwelli*), ♀. Received in exchange.
1 Cinereous Opossum (*Didelphys cinerea*). Received in exchange.
15. 1 Squirrel Monkey (*Saimaris sciurea*), ♂. Presented by Ed. Calthrop, Esq.
1 Michie's Tufted Deer (*Elaphodus cephalophus*), ♂. Purchased. See P. Z. S. 1878, p. 790.
2 Ruddy Sheldrakes (*Tadorna rutila*). Purchased.
1 Naked-throated Bell-bird (*Chasmorhynchus nudicollis*), ♂. Purchased.
3 Blue-bearded Jays (*Cyanocorax cyanopogon*). Purchased. From Bahia.
1 Saturnine Mocking-bird (*Mimus saturninus*). Purchased. From Pernambuco.
2 Lined Finches (*Spermophila lineola*). Purchased. From Pernambuco.
2 Guttural Finches (*Spermophila gutturalis*). Purchased. From Pernambuco.
1 Pileated Song-Sparrow (*Zonotrichia pileata*). Purchased. From Rio de Janeiro.
1 Palm-Tanager (*Tanagra palmarum*), ♀. Purchased. From Monte Video.
1 Dark-winged Buzzard (*Leucopternis scotoptera*). Purchased. From Bahia.
16. 1 Patas Monkey (*Cercopithecus ruber*). Purchased.
17. 1 Emu (*Dromæus novæ-hollandiæ*). Presented by C. Hampden Wigram, Esq.
2 Radiated Tortoises (*Testudo radiata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
19. 1 Water-Rail (*Rallus aquaticus*). Presented by Capt. H. F. Salvin.
21. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Capt. E. Waterhouse.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Samuel Thompson.
22. 1 Common Seal (*Phoca vitulina*). Presented by Messrs. Thompson and Gough.

Oct. 22. 1 Bornean Fireback (*Euplocamus nobilis*), ♀. Presented by A. Dent, Esq. From Northern Borneo.
2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Presented by Edward Trelawny, Esq.
1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
23. 1 Common Jackal (*Canis aureus*). Presented by Capt. Easson.
1 Common Roe (*Capreolus caprea*), ♂. Presented by Edward Jones, Esq.
1 Mandarin Duck (*Aix galericulata*), ♀. Purchased.
24. 1 Merrem's Snake (*Liophis merremi*). Purchased.
1 Plumbeous Snake (*Oxyrrhopus plumbeus*). Purchased.
1 Black-headed Snake (*Homalocranion melanocephalum*). Purchased.
1 D'Orbigny's Snake (*Heterodon d'orbignyi*). Purchased.
1 Anaconda (*Eunectes murinus*). Purchased.
1 Tuberculated Lizard (*Iguana tuberculata*). Purchased.
1 Teguexin Lizard (*Teius teguexin*). Purchased.
1 Common Marmoset (*Hapale jacchus*). Purchased.
25. 2 Ruddy Sheldrakes (*Tadorna rutila*). Received in exchange.
27. 1 Wood-Owl (*Syrnium aluco*). Presented by F. W. Jaedecke.
28. 1 Grison (*Galictis vittata*), ♀. Presented by H. Potier, Esq.
29. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Mrs. Tranchell.
1 Rhesus Monkey (*Macacus erythræus*). Deposited.
1 Horse-shoe Snake (*Zamenis hippocrepis*). Presented by W. C. Verner, Esq. From Gibraltar.
30. 2 South-American Rat-Snakes (*Spilotes variabilis*). Presented by G. H. Hawtayne, Esq., C.M.Z.S. From Demerara.
1 Chequered Elaps (*Elaps lemniscatus*). Presented by G. H. Hawtayne, Esq., C.M.Z.S. From Demerara.
31. 1 Mesopotamian Fallow Deer (*Dama mesopotamica*), ♀. Purchased. See P. Z. S. 1878, p. 790.
2 Small-scaled Mastigures (*Uromastix microlepis*). Presented by Capt. Phillips.
1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by Henry Hands, Esq.
1 Common Boa (*Boa constrictor*). Presented by W. D. Bell, Esq.

Nov. 1. 2 Japanese Pheasants (*Phasianus versicolor*), ♂ and ♀. Purchased.
1 Gold Pheasant (*Thaumalea picta*), ♂. Purchased.
1 Lineated Pheasant (*Euplocamus lineatus*), ♂. Purchased.
2 Barred-tailed Pheasants (*Euplocamus reevesi*), ♂ and ♀. Purchased.
1 Siamese Pheasant (*Euplocamus prælatus*), ♂. Purchased.
1 White-crested Kaleege (*Euplocamus albocristatus*), ♀. Purchased.
2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ and ♀. Purchased.
1 Bewick's Swan (*Cygnus bewicki*), ♀. Purchased.
2 Macaque Monkeys (*Macacus cynomolgus*), ♀. Presented by Mr. C. Loveless.
1 Weasel (*Mustela vulgaris*). Purchased.
2. 1 Three-quarter-bred Zebu (between *Bos indicus* ♂, and hybrid *B. frontalis* ♀). Born in the Menagerie.

Nov. 2. 1 Green Tree-Frog (*Hyla arborea*). Presented by Lord Arthur Russell, M.P., F.Z.S.
1 Spotted Salamander (*Salamandra maculosa*). Presented by Lord Arthur Russell, M.P., F.Z.S.
1 Common Hedgehog (*Erinaceus europæus*). Presented by Mr. E. Sass.
3 Green Tree-Frogs (*Hyla arborea*). Presented by Mr. E. L. Boyd.
5. 1 Sykes's Oriole (*Oriolus kundoo*). Received in exchange.
6. 2 Squirrel-like Phalangers (*Belideus sciureus*). Presented by E. S. Waller, Esq.
7. 1 Blue-and-yellow Macaw (*Ara macao*). Deposited.
1 Yellow-shouldered Amazon (*Chrysotis ochroptera*). Deposited.
8. 2 Arabian Baboons (*Cynocephalus hamadryas*), ♂ and ♀. Presented by C. Wood, Esq.
1 Burchell's Zebra (*Equus burchelli*), ♀. Received in exchange.
1 Sulphury Seed-eater (*Crithagra sulphurata*). Purchased.
2 Hooded Crows (*Corvus cornix*). Presented by Capt. F. H. Salvin.
9. 1 Nisnas Monkey (*Cercopithecus pyrrhonotus*). Purchased.
1 Red-fronted Lemur (*Lemur rufifrons*). Purchased.
1 Mantchurian Deer (*Cervus mantchuricus*), ♀. Purchased.
1 American Tantalus (*Tantalus loculator*). Purchased.
2 Hudson-Bay Squirrels (*Sciurus hudsonius*). Purchased.
11. 1 Woodcock (*Scolopax rusticola*). Purchased.
1 Sun-Bittern (*Eurypyga helias*). Deposited.
12. 2 Egyptian Jerboas (*Dipus ægyptius*). Purchased.
1 Cananina Snake (*Spilotes pœcilostoma*). Purchased.
1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Mr. F. Hinde.
13. 2 Horsfield's Tortoises (*Testudo horsfieldi*). Presented by Dr. A. Strauch, C.M.Z.S. From Turkestan. See P. Z. S. 1878, p. 975.
14. 1 Wanderoo Monkey (*Macacus silenus*), ♀. Deposited.
15. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Miss G. E. Marryat.
1 Spix's Macaw (*Ara spixi*). Purchased. See P. Z. S. 1878, p. 976.
18. 1 Macaque Monkey (*Macacus cynomolgus*). Deposited.
19. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by T. Beck, Esq.
22. 2 Yellow-billed Grosbeaks (*Pheucticus chrysogaster*), ♂ and ♀. Purchased. From Cuzco.
1 Black-crested Cardinal (*Gubernatrix cristatella*). Purchased.
2 Red-crested Cardinals (*Paroaria cucullata*). Purchased.
24. 1 Equine Antelope (*Hippotragus equinus*), ♂. Received in exchange.
25. 1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*), ♂. Presented by Dr. J. F. Chittenden, C.M.Z.S. From Trinidad.
1 Hybrid Vulturine Guinea-fowl (between *Numida vulturina* and *N. meleagris*). Presented by Mons. J. M. Cornély, C.M.Z.S.
1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
1 Black Lemur (*Lemur macaco*), ♂. Purchased.
26. 1 Water-Rail (*Rallus aquaticus*). Presented by W. Thompson, Esq.

Nov. 26. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Dr. Whately, R.N.
28. 2 Common Cormorants (*Phalacrocorax carbo*). Presented by F. Buckland, Esq., F.Z.S.
29. 1 Common Peafowl (white variety) (*Pavo cristatus*), ♂. Presented by Mrs. Russ.
30. 1 Rufous-vented Guan (*Penelope cristata*). Purchased.

Dec. 2. 3 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
1 Kinkajou (*Cercoleptes caudivolvulus*). Purchased.
3. 2 Black-faced Spider Monkeys (*Ateles ater*), ♂ and ♀. Presented by Mr. A. Gonzalez Carazo.
2 Rufous-vented Guans (*Penelope cristata*). Presented by Mr. A. Gonzalez Carazo.
2 Horsfield's Tortoises (*Testudo horsfieldi*). Presented by Dr. A. Strauch, C.M.Z.S. From Turkestan.
4. 1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mr. A. G. Lytton Squires.
2 Black-eared Marmosets (*Hapale penicillata*). Presented by the Countess of Cottenham.
2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Mr. Edwin A. B. Crochett.
1 Rhomb-marked Snake (*Psammophylax rhombeatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3 Rufescent Snakes (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Aurora Snake (*Lamprophis aurora*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
8. 1 Ceylon Jungle-Fowl (*Gallus stanleyi*), ♀. Presented by Mr. G. Lyon Bennett.
2 Ring-necked Pheasants (*Phasianus torquatus*), ♀. Presented by Mr. G. Lyon Bennett.
1 Grey Francolin (*Francolinus ponticerianus*). Presented by Mr. G. Lyon Bennett.
9. 1 Mayotte Lemur (*Lemur mayottensis*), ♂. Purchased.
1 Ocelot (*Felis pardalis*). Purchased.
1 Globose Curassow (*Crax globicera*). Purchased.
3 Yellow-winged Blue Creepers (*Cæreba cyanea*). Purchased.
11. 1 Common Swan (*Cygnus olor*). Presented by Capt. Marx.
1 Yellow Baboon (*Cynocephalus babouin*), ♂. Presented by Mr. G. A. Shaw.
2 Ring-tailed Lemurs (*Lemur catta*), ♂ and ♀. Presented by Mr. G. A. Shaw. From Betsileo, Madagascar.
1 Ring-tailed Lemur (*Lemur catta*), ♂. Deposited.
1 Broad-nosed Lemur (*Hapalolemur simus*). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
1 Brown Mouse Lemur (*Cheirogaleus milii*?). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
9 Smith's Dwarf Lemurs (*Microcebus smithii*). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
1 Common Fox (*Canis vulpes*), ♂. Presented by Sutton Sharpe, Esq.
1 Woodcock (*Scolopax rusticula*). Presented by Messrs. E. and W. H. Davis.
14. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by J. Williams, Esq.
1 Ceropsis Goose (*Cereopsis novæ-hollandiæ*). Purchased.

Dec. 16. 1 Pine-Martin (*Martes abietum*), ♀. Presented by Robert Walters, Esq., F.Z.S.

17. 1 Ring-hals Snake (*Sepedon hæmachates*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Hissing Sand-Snake (*Psammophis sibilans*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

18. 2 Green-cheeked Amazons (*Chrysotis viridigenalis*). Purchased.
2 Guatemalan Amazons (*Chrysotis guatemalæ*). Purchased.
1 Golden-naped Amazon (*Chrysotis auripalliata*). Purchased.
1 Crowned Eagle (*Spizaetus coronatus*). Presented by J. da Costa Andrade, Esq.

19. 1 Grey Ichneumon (*Herpestes griseus*). Presented by J. B. Jameson, Esq.

20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.

24. 1 Common Barn-Owl (*Strix flammea*). Presented by W. Davies, Esq.

26. 2 Philantomba Antelopes (*Cephalophus maxwelli*), ♂ and ♀. Purchased.
2 Egyptian Jerboas (*Dipus ægyptius*). Purchased.

27. 1 White-whiskered Paradoxure (*Paradoxurus leucomystax*). Presented by G. Wilson, Esq.
1 Common Coot (*Fulica atra*). Presented by T. H. O'Donoghue, Esq.

29. 3 River-Jack Vipers (*Vipera rhinoceros*). Received in exchange.

30. 6 Brown Tritons (*Geotriton fuscus*). Presented by Prof. Giglioli, C.M.Z.S. From Italy.

31. 1 Feline Douroucouli (*Nyctipithecus felinus*), ♂. Purchased.
1 Punjaub Wild Sheep (*Ovis cycloceros*), ♀. Presented by Col. W. R. Alexander. From Upper Sind. See P. Z. S. 1879, p. 2.

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Printed by Taylor and Francis, Red Lion Court, Fleet Street.

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